INCORPORATING FOOD SECURITY INTO REGIONAL STRATEGIC ENVIRONMENTAL ASSESSMENT

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ABSTRACT

Adequate consideration for health in strategic environmental assessment (SEA) is important for effective and sustainability-driven SEA practice. Food security is fundamental to human health and is threatened, in part, by industrial development, yet is given little to no attention in environmental assessment (EA) discourse despite its importance to health and sustainability. Regional strategic environment assessment (RSEA) is an evaluation process that informs strategic decision-making related to natural resources extraction and development and it is well-positioned to integrate food security considerations in environmental governance. This study explores how food security may be effectively incorporated into RSEA conducted for natural resource development in Canada and internationally.

This study proceeded in two phases and used standard qualitative research methods. In phase one, semi-structured interviews with food security experts were conducted. This was followed by inductive thematic data analysis to identify key criteria and requirements for effective food security assessment that align with RSEA process demands and constraints. This set the stage for phase two, which consisted of a document analysis of 17 Canadian SEAs performed for offshore petroleum exploration projects. Phase two adopted a deductive thematic data analysis to identify latent and indirect consideration for food security within the SEA reports, then further evaluated the SEAs using magnitude scales to quantify the level and means of consideration for food security.

No direct evidence of consideration for food security was found in any of the 17 SEAs analyzed. Many of the shortcomings of practice were consistent with the general shortcomings of SEA practice, previously identified in the literature. These included limited consideration for the socio-economic environment in comparison to the biophysical environment, and inadequate public participation measures. Some evidence of indirect consideration for food security was identified in the 17 SEAs analyzed. When present, these practices generally aligned with the recommendations for food security evaluation established in phase one of the research. Thus, the findings suggest that RSEA has a solid foundation to fully incorporate evaluation of food security. The product of this thesis is a framework aimed to guide adequate and effective consideration and assessment of food security in RSEA processes, based on food security expert recommendations and grounded in the state of SEA practice. It is anticipated that the framework will provide a valuable tool for RSEA practitioners in the future, contributing to efforts to improve both RSEA effectiveness and food security in areas affected by natural resource development programs.

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LIST OF ABBREVIATIONS

BMI	body mass index
EA	environmental assessment
EIA	environmental impact assessment
FSC	food, social and ceremonial
GDP	gross domestic product
HIA	health impact assessment
IAIA	International Association of Impact Assessment
PTPS	percentage of the total possible score
RSEA	regional strategic environmental assessment
SA	sustainability assessment
SEA	strategic environmental assessment
SIA	social impact assessment
TK	traditional knowledge
USAID	United States Agency for Impact Assessment
VEC	valued ecosystem component

CHAPTER 1

INTRODUCTION

1.1 Research Problem

Global food insecurity has reached unprecedented levels with prevalence increasing over the last five years. Current estimates suggest that approximately two billion people in the world, over one quarter of the world's population, are experiencing moderate to severe levels of food insecurity (FAO, IFAD, UNICEF, WFP, & WHO, 2020). Not surprisingly, food security has become central to the global development agenda, prioritized in the United Nation's sustainable development goals (United Nations, 2015b). Strategic environmental assessment (SEA), as a proactive governance process, is well suited to integrate food security as its purpose is to direct development decisions toward sustainable development. Integration of food security in SEA is particularly opportune because it is highly utilized process when planning for natural resources extraction development—a form of development associated with deteriorating food security (O'Rourke & Connolly, 2003; Schilling, Schilling-Vacaflor, Flemmer, & Froese, 2020). In efforts to identify options to enhance food security for communities affected by the onset of industrial regional resource development, this research explores the food security and SEA nexus.

Food security is a multifactorial social phenomenon fundamental to human health and community sustainability (Loring & Gerlach, 2009; Partidario, 2015). The definition of food security was once an elusive concept; however, interpretations have stabilized substantially over the past couple of decades (Coates, 2013). Today, food security is typically defined as: a situation in which "all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO, 1996), encompassing four dimensions, as followed: (i) availability – the adequate supply of food; (ii) access – physical and economic access to preferred food; (iii) utilization – nutritious, safe and culturally appropriate food; and (iv) stability – resiliency and security to maintain continued access, availability and utilization (FAO, IFAD, & WFP, 2013).

Food security is fundamental to human health and wellbeing. However, beyond the obvious physical health outcomes associated with insufficient intake of food or undernourishment; food security is also linked to psychological and socio-cultural health (Loring & Gerlach, 2009): cultural disintegration may result from the inability for a community to obtain preferred or culturally appropriate food; severe stress may result from a fear that food is contaminated; or anxiety may arise from a perception of instability to sustain a sufficient supply of preferred food, for example (Cafiero, Melgar-Quiñonez, Ballard, & Kepple, 2014; Lambden, Receveur, & Kuhnlein, 2007). Food insecurity—any degree to which food security is not achieved—is thus understood as a critical health issue that demands immediate attention (McIntyre, 2003; Vozoris & Tarasuk, 2003).

Food insecurity ranges from severe to marginal; however, it should be considered a serious health issue for those experiencing any degree of food insecurity across the spectrum of severity. Cook et al. (2013) attest that health outcomes for those experiencing marginal food insecurity are much more closely related to outcomes associated with severe food insecurity than to those associated with food security. Without diminishing the gravity and seriousness of severe food insecurity—which undoubtedly remains to be the most detrimental form—Cook et al. infer that the health impacts associated with marginal food insecurity are regularly underacknowledged. This finding suggests that the issue of food insecurity is underestimated and overlooked in certain contexts—such as in regions where marginal food insecurity is prevalent, like in Canada or other developed counties—in spite of the harm it poses to human health (Coleman-Jensen, Rabbitt, Gregory, & Singh, 2015; Tarasuk, Mitchell, & Dachner, 2014).

Beyond its link to health, food security is also closely related to sustainability. Sustainability has become an important concept in the contemporary global political landscape and refers to a goal in which development and governance directives aim to balance economic, environmental and social welfare (Robert, Parris, & Leiserowitz, 2005). Berry et al. (2015) recognize the connection between food security and sustainability to be so important that one cannot exist without the other. The connection between food security and sustainability has been further recognized with its formal integration in United Nations global development agenda for 2015-2030 (United Nations, 2015b); thus, any development, policy or programme that is intended to be sustainable—now an international standard for development—should consider food security.

Food security is threatened by global climate change, industrial development and socioeconomic factors (Nilsson et al., 2013). Industrial natural resource development and extraction activities are notably important when considering threats to food security because these activities have the potential to negatively and severely impact all four dimensions of food security. Environmental, economic and social impacts from industrial resources development and extraction activities are numerous and well documented in scholarly review (see Ko & Day, 2004; O'Rourke & Connolly, 2003). Oil exploration, drilling and extraction, for example, has shown to result in a slew of adverse impacts on the natural environment: deforestation and general ecosystem clearing carried out to provide space for equipment, transportation and operations displace animal populations and diminish local resource supplies; produced water, a major by-product of drilling activities, is highly contaminated with a variety of toxins and heavy metals and may harm or displace marine life; noise and vibrations may force animal relocation; and oil spills damage marine ecosystems by introducing a foreign and toxic substance into the environment that wreaks havoc on normal flora and fauna biological functions and ecological interactions; to name a few (National Research, 2003; O'Rourke & Connolly, 2003; Teal & Howarth, 1984). Impacts of this nature could affect availability and access to food because the food source may vanish or be more difficult to harvest, it could affect utilization of food because a food source may be contaminated or keystone species that are important to a culture's way of life or a community's livelihood may be unavailable, and it could impact stability of food because the entire region's long term food system may be compromised with the disappearance of an important system connector (Fazzino & Loring, 2009; Loring & Gerlach, 2015). Furthermore, natural resource developments often take place in regions that are largely undeveloped, yet house communities and individuals that rely heavily on their surrounding ecosystem for food and livelihood (O'Rourke & Connolly, 2003). Communities living in resource-rich territory susceptible to extraction and industrial development are diverse, but a large proportion are Indigenous (O'Faircheallaigh, 2013). Indigenous communities living within these regions are particularly vulnerable to threats associated with industrial natural resource development—chiefly to food security—because they typically have an important connection to and reliance on their surrounding ecosystem (Nilsson et al., 2013; O'Faircheallaigh, 2013; Power, 2008). Furthermore, higher rates of poverty, lower levels of educational attainment, and greater rates of single parent homes intensify their

vulnerability to food insecurity (Lambden et al., 2007; Willows, Veugelers, Raine, & Kuhle, 2009).

The natural resource sector in Canada accounts for a significant portion of the country's economy (Hessing, Howlett, & Summerville, 2005). In 2020, the natural resources sector was responsible for approximately 17% of Canada's gross domestic product (GDP) and 1.9 million jobs (Natural Resources Canada, 2020). Despite the recent global downturn in oil prices and a global oversupply of the resource, extraction activities continue across the country. Notwithstanding a decline in oil and gas revenues, extraction continued to grow with an increase of 0.2% in 2016, "the seventh consecutive annual increase" (Statistics Canada, 2017). A more recent Statistics Canada report suggests that oil and gas extraction continued to grow steadily: in May 2018, oil and gas extraction rose 2.5%, marking the sixth rise in production volume in a seven month period (Statistics Canada, 2018).

The risk associated with natural resources extraction development is considerable and is a pressing concern with regard to food security. It is clear that there is a need for food security to be addressed in decision-making processes when planning for resource extraction in Canada. An increasing pervasiveness of food insecurity in Canada, and particularly within remote and rural communities, further highlights the importance for food security consideration in governance (Nilsson et al., 2013; Tarasuk et al., 2014). One study conducted in 2012 estimated that the number of households experiencing food insecurity in Canada increased steadily between 2007 to 2011 from around 1.4 million to around 1.7 million (see Tarasuk et al., 2014). A more recent study suggests that the steady increase continued with approximately 1.8 million Canadian households experiencing food insecurity in 2017-18 (Tarasuk & Mitchell, 2020). Unfortunately, the consideration for food security in Canadian governance practice, generally, and Canadian welfare policy, specifically, is limited (Riches, 1999, 2002). More research is needed to identify ways to better integrate food security in regional planning processes associated with resource development and extraction activities, so that it is more effectively addressed in Canadian decision-making processes. Proactive policy and planning interventions considerate of food security issues would assuredly aid in the enhancement of food security of remote and Indigenous communities affected by resource development.

Strategic environmental assessment (SEA) is a widely utilized and respected process used by governments, organizations and industries worldwide to proactively address potential impacts

of human development projects, plans or programmes, inform decision-makers and advance sustainability objectives (Dalal-Clayton & Sadler, 2005a). Since its development in the late 1980s, SEA has gained substantial support and credibility internationally and it is now formalized and legislated in dozens of countries (Bond & Pope, 2012; T. Fischer & Onyango, 2012) including Canada. Although it is not officially legislated in Canada, SEA is formalized by Cabinet Directive and is recommended for all policies, plans and programmes that are expected to result in significant impacts (Privy Council Office & CEAA, 2010). Furthermore, as it gains popularity and credibility as a tool to achieve environmental sustainability in Canada, its use is rapidly growing (Baker & Kirstein, 2011; CCME, 2009; Johnson et al., 2011).

Regional strategic environmental assessment (RSEA) is a version of SEA that has gained popularity in Canada since the turn of the 21st century (Johnson et al., 2011). RSEA is favoured in certain natural resource sectors to improve the assessment of cumulative effects, facilitate integrated project environmental assessments, and better respond to regional issues that are not adequately considered in traditional regulatory-based assessment (Gunn & Noble, 2009). Environmental assessments related to resource extraction activities are increasingly adopting an RSEA approach because its broader scale of assessment allows for adequate consideration of alternative sites for development (Baker & Kirstein, 2011), as well as a range of alternative development scenarios. RSEA processes are particularly well-positioned to address food security because they are already highly regarded and increasingly utilized in planning for industrial resource developments. Additionally, food systems are characteristically regional (Clancy & Ruhf, 2010) and impacts from human development projects, particularly those associated with food security, often extend beyond local spatial and temporal scales. As RSEA evaluates suitability of alternative development scenarios for a particular region it is thus the most appropriate scale of impact analysis for food security, which requires a regional scale in order to adequately understand and consider appropriate mitigation or adaptation strategies (Ericksen, Ingram, & Liverman, 2009).

1.1.1 Research Purpose and Objectives

To date, despite the obvious potential impacts on food security from resource extraction, especially in areas where people practice fishing, hunting, and other country-food harvesting activities, food security appears to have been largely left out of Canadian RSEA processes

specifically, and SEA generally. Contemporary SEA processes are mandated to advance sustainable development as well as consider health and social impacts (T. Fischer, Matuzzi, & Nowacki, 2010; Privy Council Office & CEAA, 2010). Thus, failure to address food security in RSEA processes may be regarded as a major shortcoming of the process, particularly when assessing strategies, policies or programmes that precede allowance for resource development and extraction activities.

As such, the purpose of this research is to explore how food security may be effectively addressed in RSEA processes conducted when planning for natural resources developments in Canada. The objectives of this research are to:

i. Identify food security assessment approaches and key criteria that align with established RSEA methodologies and context;
ii. Determine the extent and manner to which food security has been considered in Canadian SEA practice to date; and,
iii. Develop a framework to effectively integrate food security assessment in RSEA processes

1.2 Research Rationale

Food insecurity is a major global problem that affects hundreds of millions of people around the world (FAO, IFAD, & WFP, 2014). By one estimate, food insecurity in Canada affects over four million individuals and, notably, over one in six children. Furthermore, the same study suggests that the prevalence of food insecurity in Canada has increased over the past decade despite mitigation efforts (Tarasuk & Mitchell, 2020). With the serious health outcomes associated with food insecurity, its increased prevalence in Canada suggests that more research is needed to investigate how Canadian governance processes can more effectively address food insecurity. By focusing on the effective consideration for food security in Canadian RSEA, this thesis will provide insight in that endeavour.

Improving effectiveness has recently been a common theme within SEA and food security literature alike, and tremendous strides have been made in the respective areas of research over the past several decades (Chanchitpricha & Bond, 2013; Coates, 2013; Tetlow & Hanusch, 2012). Adequate consideration of health in environmental assessment (EA) processes, as an important aspect of social wellbeing and sustainability, is an area within EA effectiveness research that has

garnered attention. The introduction of health impact assessment (HIA) as a specialized EA process, for instance, is one outcome of the efforts to more effectively address human health in both EA and in governance processes (Bhatia & Wernham, 2008). Likewise, literature focused on improving food security measurement and assessment so that human health and wellbeing are better considered in governance processes is robust. At present, however, these two bodies of literature aimed at effectiveness of SEA and food security assessment are almost entirely separate from one another. Bringing these two fields of study together will enhance both fields of study by investigating how food security can be integrated into a formal and credible planning process, and by investigating how SEA processes can more effectively advance sustainable development.

The goal of this research is to develop a conceptual framework to effectively integrate food security in RSEA processes. This novel research product will serve as an important tool for SEA practitioners in the future to identify opportunities and approaches for incorporating food security effectively. Specifically, the incorporation of food security in SEA processes will foster better consideration for social and behavioural determinants of health, and thus the social dimensions of sustainability. As such, this research will contribute to the development of a more effective SEA process that better aligns with its mandated performance criteria. Moreover, such considerations will aid in efforts to mitigate food insecurity, which is an important requirement for the advancement of sustainable development in Canada (Berry et al., 2015). Industry involved in resource development may also benefit from the outcome of this research because communities may be more willing to approve of a proposed development if they believe their health and wellbeing is considered and safeguarded. Additionally, the growing research interest in improving both SEA processes as well as food security governance indicates that this research will be a valued contribution to these fields.

1.3 Thesis Organization

This thesis adopts a traditional thesis format. Following this introduction, Chapter 2 provides a literature review which describes the current state of knowledge on health and food security consideration in SEA. Topics include: SEA origin and evolution; RSEA; SEA effectiveness; integration of health in SEA; health impact assessment (HIA); and food security consideration in SEA. The purpose of the literature review is to identify the research gap and position this thesis research within the current body of knowledge. Chapter 3 provides a detailed

summary of the research methodology for this study. Chapter 4 reports and discusses the research results and findings for phase one of research, while chapter 5 reports on the results and provides a discussion resulting from the second phase of research. Chapter 5 includes a presentation of the proposed framework for integrating food security into RSEA. The final chapter, chapter 6, provides the major conclusions arising from this research and recommendations for future research.

CHAPTER 2

LITERATURE REVIEW

The purpose of this chapter is to: (i) characterize the state of research on food security in strategic environmental assessment, also looking more broadly at studies connecting food security and impact assessment; (ii) identify gaps in scholarship and/or EA practice; and (iii) explain the contribution of this study to filling the gaps.

2.1 SEA

2.1.1 Origin and Evolution of SEA

The growth of SEA as a tool to assist in decision-making processes has been significant—both conceptually and in practice—since its development in the late 1980s (Partidario, 2015; Tetlow & Hanusch, 2012). The conceptual evolution of SEA has been particularly significant and reflects changes in governance priorities over the past few decades, which have shifted toward more integrated planning practices that focus on sustainability (Bagheri & Hjorth, 2007; Haughton & Counsell, 2004).

Strategic Environmental Assessment origins are firmly rooted in environmental impact assessment (EIA). As an independent process, SEA was initially introduced to better analyze development plans at a strategic level—partly in response to limitations identified with EIA (Bina, 2007; T. Fischer & Onyango, 2012). Environmental impact assessment and SEA are both EA processes utilized to identify and mitigate impacts that may result from development decisions. However, EIA is traditionally applied at a project level to assess impacts of proposed developments (Bina, 2007). Project-based EIA has become a very important tool in environmental management processes and, as such, is now required in dozens of counties around the world, including Canada (Bond & Pope, 2012; T. Fischer & Onyango, 2012).

Early applications of SEA often utilized a similar procedural framework to that of EIA. Although there are still several similarities in procedural methodology, the scope and objectives of SEA have progressed over the years. Early SEAs were largely conducted in response to a development decision and were thus reactive in nature. Additionally, the focus was almost exclusively aimed at impacts on the physical environment (Morrison-Saunders & Fischer, 2006).

Criticisms within the literature, which suggested that early applications of SEA were too reactive, narrow in focus and unable to influence decision-making processes in early stages of developments, catalyzed the evolution of the process (T. Fischer, 2014; Partidario, 2015). Today SEA is used as a diagnostic and proactive tool to inform and influence decision-making in the early stages of planning with a goal to advance sustainable development (Bina, 2007; Dalal-Clayton & Sadler, 2005a; Tetlow & Hanusch, 2012; White & Noble, 2013). Emphasis is placed on evaluating alternative development scenarios with respect to their anticipated performance in light of various goals, objectives, and performance standards.

Contemporary SEA is intended to be a broad and inclusive process that considers the social and economic dimensions of development, in addition to impacts on the physical environment (White & Noble, 2013). Sustainable development, now widely understood as the underlying purpose of SEA (Tetlow & Hanusch, 2012), is defined as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987). This widely accepted definition is intentionally broad in order to apply to a variety of development contexts and includes careful consideration of the social, economic and biophysical environments such that "sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are made consistent with future as well as present need" (World Commission on Environment and Development, 1987).

With the shift in focus from the physical environment to that of sustainability, SEA has become increasingly comprehensive. Today, SEA legislation frequently mentions sustainability as a primary objective of the process. The International Association of Impact Assessment (IAIA) declares that a "good-quality strategic environmental assessment" must contribute to sustainable development and is sustainability-led (IAIA, 2002). The Canadian SEA directive, likewise, expects SEA to contribute to sustainable development (Privy Council Office & CEAA, 2010). Although SEA is evolving, there have been concerns about the speed to which SEA has been able to transition to its new form in practice. Theoretical and conceptual understandings of SEA appear be much more evolved than practical applications of SEA (Gunn & Noble, 2009). Strategic environmental assessment seems to be constrained by its EIA roots as it often continues to be

narrowly focused on the biophysical environment and used more as a response to development plans. As such, the objective of SEA to advance sustainable development remains a challenge.

2.1.2 RSEA

Some scholars suggest that RSEA is more adequately positioned to carry out the contemporary objectives of SEA and advance sustainable development. Regional strategic environmental assessment is a version of SEA that evaluates proposed development across a larger geographical area. The broader spatial focus of RSEA allows for a more comprehensive understanding of cumulative effects and provides opportunities to recognize connections and relationships within a region (Gunn & Noble, 2009; Johnson et al., 2011). Moreover, a regional focus allows practitioners to examine a range of alternative development scenarios and evaluate how each alternatives option may ultimately align with or affect larger strategic goals for that region, including multiple levels of governance, land use management, and policy goals. (Baker & Kirstein, 2011; Gunn & Noble, 2009)

Within academic literature, a regional scale of analysis is increasingly understood to be fundamental to contemporary planning practices (Haughton & Counsell, 2004), particularly when impacts are known to be far-reaching across time and space. Correspondingly, a new area of study on "new regionalism" has emerged within the field of rural development scholarship following the push for heightened regional integration in development planning (Markey, 2011). Heightened awareness of interactions and linkages among places, people and things have shifted uni-dimensional thinking in planning to a more holistic and multifaceted approach to reasoning: an emphasis on connections among society, the biophysical environment and the economy is now demanded (Cash et al., 2006). Similar to other forms of contemporary SEA, RSEA is intended to facilitate a proactive planning process that advances sustainable development. RSEA is considered to be the most appropriate form of SEA for anticipated natural resources development or extraction activities, and is increasingly utilized in natural resources governance practices (Baker & Kirstein, 2011). In Canada, RSEA has been embraced by the federal government and is recommended for use in complex regional planning and decision-making contexts (CCME, 2009; Johnson et al., 2011). However, RSEA development is still in its infancy and to date there are no established best practices; as such, the effectiveness of RSEA is largely unknown at present (Gunn & Noble, 2009, 2011; Olagunju & Gunn, 2016). Although RSEA has

not been the explicit subject of most EA effectiveness research, RSEA effectiveness is as critical as the effectiveness of any other form of EA. Recognizing that the scope of an RSEA is typically vast—both in time and space—the influence of RSEA has tremendous potential to temper adverse development impacts and progress sustainability efforts. On the other hand, the effectiveness of EA, more generally, has been the subject of debate for the past few decades (Fuggle 2005), and resulting research on SEA effectiveness that has proliferated in recent years can be—at least in part—applied to RSEA.

2.1.3 SEA Effectiveness

Research investigating the effectiveness of SEA has been a top priority in SEA research since the mid-2000s (T. Fischer & Onyango, 2012). Within the literature, effectiveness is broadly defined as how "something works as intended and [how it] meets the purpose(s) for which it is designed" (Sadler, 1996, p. 37). However, research in SEA effectiveness covers a wide range of topics, and more specialized areas within SEA effectiveness have also developed within the field of study, each focusing on more precise subject matters. While some of the literature is concerned with the theoretical underpinnings of SEA effectiveness measurement, a significant portion of research is concerned with assessing current EA practice, or, alternatively, developing frameworks and tools to measure EA effectiveness. It is in this body of literature that operational categories for defining types of effectiveness, within the broader field of SEA effectiveness research, have been defined. Most prominent amongst the categories are: procedural effectiveness—concerned with how well established procedural and professional standards and provisions are carried out; and substantive effectiveness—concerned with the extent to which SEA purpose, goals and objectives are met (Chanchitpricha & Bond, 2013).

In the past, research on SEA effectiveness was most commonly concerned with its ability to influence and change policy plans or programmes (Tetlow & Hanusch, 2012). While this concern with substantive effectiveness is still a major focus, the scope of its influence is now more commonly gauged in correspondence to its purpose, goals and objectives (T. Fischer & Onyango, 2012; Tetlow & Hanusch, 2012). As such, scholars today are chiefly interested in the SEA process and its ability to perform in accordance with established SEA performance standards and criteria and, in turn, its capacity to carry out its objectives (T. Fischer, 2014; Noble, 2003; Partidario, 2015; Tetlow & Hanusch, 2012). A major focus in recent SEA effectiveness research

is, therefore, on auditing SEA procedural effectiveness to investigate its performance quality (Noble, 2003; Tetlow & Hanusch, 2012). With the linkage between process and outcome within SEA effectiveness literature, the distinction between procedural and substantive effectiveness is blurred. In particular, much of SEA effectiveness literature focuses on evaluating SEA practice to determine how well various components of sustainability are addressed within the process and following its application (Douglas, Carver, & Katikireddi, 2011; T. Fischer et al., 2010; T. Fischer & Onyango, 2012; Tetlow & Hanusch, 2012; White & Noble, 2013).

It is not surprising that the capacity for SEA to effectively advance sustainable development has been a popular topic in SEA effectiveness research, given that it is an underlying objective of the process. It is also not surprising that several shortcomings have been identified in this regard—sustainability is, after all, an extremely complex and abstract concept. Research investigating how specific elements of sustainability are being addressed in SEA practice is one area of research that has emerged within the broader field of SEA effectiveness. A focus on discrete facets of the larger sustainability objective provides an opportunity to address the complex issue in a manageable and achievable manner (Eggenberger & Partidário, 2000; George, 1999). Assessing how specific sustainability objectives or indicators are being considered and integrated into SEA practice has thus become a theme within the more focused body of literature (Noble, 2002). Considerations for human health is one example of this more targeted research.

As is discussed below, food security is one consideration that is not explicitly addressed as a sustainability objective in SEA literature, but is prioritized in the United Nation's Sustainable Development Goals (United Nations, 2015b). Because food security is a fundamental component of human health and is integral for sustainability, its adequate consideration in SEA processes would not only align with the SEA performance criteria, but also with efforts to improve the effectiveness of SEA toward a more constructive and sustainable process. Furthermore, its consideration within SEA effectiveness literature aligns with the current trajectory of the field. Notwithstanding, food security appears to be largely absent from SEA effectiveness literature, and SEA literature more broadly.

2.3 State of Research: Food Security in EA

2.3.1 Explicit Consideration for Food Security in SEA

Based on an extensive search of academic journal databases, articles directly linking SEA with food security were almost non-existent.[1] A handful of articles were found that mentioned food security and EIA (see Brentrup, Küsters, Kuhlmann, & Lammel, 2004; Gallardo & Bond, 2011; Payraudeau & van der Werf, 2005; Wernham, 2007). However, these articles discuss the shortcomings associated with EIA processes more generally, mentioning food security only briefly. Additionally, where food security is discussed, considerations are focused on simplified components or individual dimensions of food security. Nonetheless, an implication within much of this literature is that project-based EIA is not sufficient, as is, to adequately address issues related to food security and that a more comprehensive approach or method is needed.

Payraudeau & van der Werf (2005), for instance, in their analysis of six different processes used to assess the regional environmental impact of agricultural activity, imply that EIA, while honorable in its intention to be guided by sustainability objectives, is not all that successful in adopting an holistic approach that is demanded by the complexity of farming activity, despite being one of the most powerful processes in terms of its influence in decision-making processes. Likewise, Gallardo and Bond (2011), in their analysis of 32 Brazilian EIAs, examine how various impacts are assessed and conclude that certain policy issues, including food security, require a more strategic focus than is possible in project-based EIA, wherein issues are discussed prior to policy development. Unlike much of the literature linking food security with EIA, Gallardo and Bond explicitly recognize SEA as a superior EA process for the consideration of policy issues that are broad in nature. Only one other source was found in which SEA is explicitly discussed in relation to food security (see Dalal-Clayton & Sadler, 2005b). Within both pieces of literature, however, food security is mentioned peripherally to discuss how SEA is an optimal EA process to address a variety of policy issues, including food security amongst broader issues like poverty reduction or labour conditions, due to its comprehensive nature and proactive approach in the policy development arena. Despite some, albeit minimal,

[1] Academic journal databases used for this search include: Scopus, Academic Search Complete (ASC) and GEOBASE. Terms used included various combinations of: “strategic environmental assessment”, “environmental assessment”, “impact assessment”, “assessment”, “health impact assessment”, “social impact assessment” and “environmental impact assessment” with: “food security” or “food”.

scholarly recognition that SEA may be a suitable form of EA to address food security little to no research has been conducted to date on how that may be accomplished.

2.3.2 Implicit Consideration for Food Security in SEA

Explicit linkage between food security and SEA may be limited; nevertheless, literature considering various issues that are related to food security are much more commonplace. Social dimensions of sustainability and human health are broader issues pertinent to food security, and research aimed at better addressing these considerations in SEA has resulted in a comparatively robust body of literature within the field of SEA effectiveness. This body of literature not only showcases how food security may be currently considered in a more indirect manner, but also provides the context for more focused studies aimed at directly integrating food security assessment into SEA.

Literature examining social dimensions of sustainability in SEA is far-reaching in terms of subject matter. For example, some literature focusing on sustainability in SEA, more generally, considers social issues in some respect (Morrison-Saunders & Fischer, 2006; Partidario, 2015; Stinchcombe & Gibson, 2001; White & Noble, 2013), other more directed research is aimed at: public consultation and involvement (Gauthier, Simard, & Waaub, 2011; Rega & Baldizzone, 2015); culture and heritage considerations (João, Vanclay, & Broeder, 2011); and human health. Food security is so intrinsically linked to human health that research examining health in SEA is most relevant to the discussion of food security in SEA.

2.2.3.1 Health in SEA

Several jurisdictions now promote or require the consideration of health in contemporary SEA processes (T. Fischer, 2013). The Canadian SEA *Directive* mentions health in its appendix, where it states that an "environmental effect" is "any change that a policy, plan or program may cause in the environmental, including any effect of any such change on health and socio-economic conditions …" (Privy Council Office & CEAA, 2010). The inclusion of health in SEA regulatory mandates, in addition to its significance to sustainability, has motivated research directed at health in SEA. Fischer and Onyango (2012), in their review of the state of SEA research, reveal that literature in health integration with SEA receives relatively minimal attention; however, there is a handful of refereed articles that do explore the integration of health

in SEA (see Bond, Cave, & Ballantyne, 2013; Douglas et al., 2011; T. Fischer, 2013, 2014; T. Fischer et al., 2010; Kørnøv, 2009).

While the inclusion of health objectives in project-based EIA processes is poor, they are considered within SEAs to a much larger extent (Douglas et al., 2011; T. Fischer, 2014). Health determinants and outcomes are complex and wide-spread (Nutbeam, 2000). It is, therefore, not surprising that health is ill-considered in EIA compared to SEA, which is broader, both in nature and structure, than EIA. Nevertheless, several shortcomings have been identified within the literature regarding integration of health in SEA in a variety of respects (Bond et al., 2013; Douglas et al., 2011; T. Fischer et al., 2010; Kørnøv, 2009).

Existing literature investigating the integration of health in SEA reveal that good baseline data on health objectives is scant in SEA reports (T. Fischer et al., 2010). Fischer et al. find that, at times, baseline health data were available but not included in many of the SEAs analyzed, and suggest that baseline data is an "important starting point for effective health inclusive SEA" (2010, p. 207). Additionally, health practitioners are often not involved in SEA processes, which limits the understanding and assessment of health impacts and weakens the support necessary to make informed decisions (Bond et al., 2013; T. Fischer, 2013; T. Fischer et al., 2010). The inclusion of health in SEA also varies considerably across jurisdictions; for example, British spatial SEAs were found to consider health and social aspects much more than German or Dutch SEAs (T. Fischer, 2014). Jurisdictional variation demonstrates that consistency is either limited or absent amongst SEAs, even amongst those administered under a single legislative directive.[2] This lack of consistency may illustrate process flexibility and adaptability that is largely advocated amongst EA scholars for its ability to adjust to the needs and demands of specific applications (T. Fischer, 2003; Partidario, 1996). Process flexibility has its drawbacks, however, as the potential to overlook important issues is present. Flexibility in SEA application is important when applying it to health objectives because health issues and outcomes vary from region to region (K. Jones, 1987, p. 266); nevertheless, it does not negate the fact that a health inclusive SEA is important to effective SEA practice in the future.

[2] Strategic environmental assessment in Europe is regulated under a EC (European Commission) Directive on SEA: Directive/2001/42/EC. Human health is identified as an important objective within the directive (European Commission, 2001).

When health is included in SEA, literature suggests that its consideration is deficient. Amongst the literature looking into how well health is considered in SEA, the greatest shortcoming identified is the utilization of broad and general objectives like 'health enhancement' or simply 'health' (Douglas et al., 2011). Although these broad objectives appear to leave room for a far-reaching assessment, general statements like 'health enhancement' contrastingly result in narrow conceptions of health (Boon, Verhoef, O'Hara, & Findlay, 2004). The result of an assessment directed at improving health, as a general and all-encompassing objective, results in the failure to recognize the multitude of health determinants and factors likely to be impacted by development. Consequently, current understandings of health in SEA emphasize biophysical health determinants (i.e., water, air, or soil quality) while social, economic or behavioural health determinants are largely excluded (Douglas et al., 2011; T. Fischer, 2013; T. Fischer et al., 2010). Accordingly, consideration for many of the health determinants directly related to food security appear to be largely ignored, which characteristically extend beyond biophysical matters. This finding aligns with other studies in SEA effectiveness literature that contend that biophysical environmental issues are given priority in SEA processes, despite the push toward a broader and more comprehensive EA process aimed at sustainability.

2.3.3 Food Security in HIA

Efforts to address health sufficiently in SEA have resulted in the development of an impact assessment process dedicated to health: health impact assessment (HIA). Health impact assessment has gained tremendous support over the last decade and aims to assess various determinants of health impacted by projects, policy, plans or programmes (Fehr et al., 2014). Some scholars suggest that HIA may help simply improve decision-makers' understandings of an interaction between health and various policies, as a result of it being discussed in a very direct manner, whereby a linkage may not be direct or immediately obvious otherwise (Lock et al., 2003). Additionally, health practitioners are regularly involved in HIA processes (Bond et al., 2013), which is important as this has been identified as a weak point when considering health in SEA generally. Health impact assessments are often conducted in conjunction with other EA processes, notably SEAs; however, they are carried out independently as well (Harris-Roxas et al., 2012; Fehr et al., 2014). Health impact assessment processes aim to assess various health

determinants, beyond the biophysical, addressing one of the greatest concerns with the integration of health in SEA.

The linkage between food security and HIA is much more developed in the literature than the linkage between food security and SEA. Dannenberg et al. (2008), in their analysis of 27 HIAs conducted in the United States for topics routinely covered in HIA, identified that food security or related food issues were considered within a number of the HIAs conducted, but the article did not detail how. The article's primary purpose was to document how HIAs are used and to advocate for greater use of the tool. Kwiatkowski (2011) suggests that HIA can be a useful tool to mitigate food safety issues that result from various developments in Canada for its Indigenous population. Kwiatkowski, however, contends that community engagement is paramount and that HIA would be more useful as a tool to mitigate impacts if used in conjunction with other EA processes.[3]

Despite the more direct and developed consideration for food security within HIA literature, the consideration for food security in HIA processes remains limited. The number of academic articles discussing food security or food related issues in HIA is slight[4] and, furthermore, interpretations of what food security is within this body of literature are largely incomplete. Food security experts widely contend that a definition of food security that is multi-dimensional and that aligns with advancements in the field is supremely important for effective assessment and intervention (Coates, 2013; Hendriks, 2015). Food security is therefore not adequately considered if it is addressed solely as an issue of food sufficiency or food safety, as it commonly is in HIA literature and practice (see Dannenberg et al., 2008; Kwiatkowski, 2011; Lock et al., 2003).

In addition to an inadequate understanding of food security in HIA, several shortcomings associated with HIA further limit its ability to improve food security for communities affected by potentially harmful development. One of the greatest flaws identified with HIA, is its ineffective integration with SEA, despite the considerable efforts to merge the processes (Bond et al., 2013). When efforts are made to integrate HIA with SEA, and other EA processes, Fehr et al. (2014)

[3] Specific EA processes advocated for integration with HIA in Kwiatkowski (2011) are social impact assessment (SIA) and EIA.

[4] Academic journal databases used for this search include: Scopus, Academic Search Complete (ASC) and GEOBASE. Search term "health impact assessment" was used to search title, subject terms or abstract with "food security" or "food" in the all text. Relevant articles were then additionally scoped by looking through their respective references and through articles which cited them.

allege that the consideration for health is diluted and health considerations are more often than not diminished to biophysical determinants. Regardless of its successful or unsuccessful integration with SEA, Harris-Roxas et al. (2012) argues that the lack of government support for HIA, more generally, limits its capacity to carry out meaningful assessments that consider the wide range of health determinants effectively. Bond et al. (2013), additionally, suggest that HIA is unable to effectively influence decision-makers. Some scholars contend that more government support may improve some of these shortcomings (Bhatia & Wernham, 2008; Harris-Roxas et al., 2012), but others suggest that standalone SEA is a better process for the consideration of health impacts to avoid duplication or loss of efficiency (Douglas et al., 2011). Harris-Roxas et al. (2012) explains that although there is value in HIA, the most important element of HIA is its pursuit to more effectively consider health in decision-making. The shortcomings associated with HIA, generally, and with seamless integration of HIA in SEA, specifically, highlight the need for continued research into the effective integration of health in SEA.

2.3.4 Food Security in Other Forms EA

Beyond HIA, social impact assessment (SIA) and sustainability assessment (SA) are other forms of EA used in strategic-level planning in which food security or food issues are discussed; however, to a limited extent. Social impact assessment, similar to that of health impact assessment, is aptly named to spotlight a specific set of issues and put them at the forefront of the assessment: social issues in the case of SIA (Esteves, Franks, & Vanclay, 2012; Lockie, 2001). Sustainability assessment as a form of EA is, at times, used as a stand-alone EA process in which the objective of sustainability is emphasized (Partidario, 2015; Pope, Annandale, & Morrison-Saunders, 2004). Given the respective and relevant purpose of both SIA and SA, the consideration for food security—which is both a social issue and fundamental to sustainability—is fitting, yet remains sparse.[5]

Articles referencing 'food' and SIA were particularly sparse, and no articles directly mentioning food security were located. Two articles were found in which food issues in SA were the primary purpose of the articles (see Dreyer, Renn, Cope, & Frewer, 2010; Pollnac et al., 2006). Whereas food security is not directly discussed, some indirect connection between food

[5] Academic journal databases used for this search include: Scopus, Academic Search Complete (ASC) and GEOBASE. Search terms "social impact assessment or SIA" and "sustainability assessment" were used to search title, subject terms or abstract with "food security" or "food" in the all text.

security and SIA is still observed. For example, Pollnac et al. (2006) examine how SIA may be modeled to apply to assessments of fisheries management actions, such that social impacts can be considered using currently available indicators, as limited as the set may be. The goal of this article is to help conceptualize a SIA model that may be easily and readily embraced amongst practitioners. Therefore, the focus is on identifying quantitative indicators of social wellbeing as they relate to commercial, subsistence and recreational fisheries: emphasis is placed on job or activity satisfaction, seemingly because it is directly relevant to fisheries. Social wellbeing, as it relates to fisheries, is certainly important to food security, but is only part of the larger issue. A strategic-based EA necessarily requires a broader focus due to its broader scale of analysis.

The link between food security and SA is identifiably greater than that of SIA, with a handful of articles mentioning food. Nonetheless, with the exception of one article (see Recanati, Castelletti, Dotelli, & Melià, 2017), literature found linking food to SA, similarly, fails to directly mention food security. Some findings within this body of research, however, provide a glimpse of insight into approaches that may be employed when considering food security in SEA.

In their article, Recanati et al. (2017) investigate how food production can be better assessed in water limited regions. Recanati et al. propose using a SA framework for assessing strategies designed to foster food security, such that the assessment include: (i) a multi-criteria analysis—where a range of instruments are utilized to gather data from a variety of viewpoints "promoting the engagement of stakeholders and usually generating a wider range of alternatives" (p.491); and (ii) integrating a water-food nexus investigation at different spatial scales—in which a water analysis is conducted at both a micro- and regional-scale, addressing the invariable connection between water and food. Recanati et al. seem to have an holistic basic understanding of food security that is in line with contemporary food security research and recognizes all four dimensions. Their focus, however, is aimed at food productivity and their approach is intended specifically for EA applied to food security programs. Nonetheless, the authors' investigation highlights the importance of multi-criteria analysis, analysis of water as a natural resource, and analysis at various spatial scales when considering food security in EA, which may be useful for SEA, as these approaches seem to be relevant to a variety of applications.

Other articles referencing food in SA focus on the application of SA to specific food-related practices, similar to Recanati et al. For example, articles were found that discuss SA

application to irrigation practices (see de Vito, Portoghese, Pagano, Fratino, & Vurro, 2017), a slow food project (see Peano, Migliorini, & Sottile, 2014), and family farm production (see Florin, van Ittersum, & van de Ven, 2012). The focus within these articles is, correspondingly, on food production; though, with no mention of food security or its other dimensions. The general line of discussion within these articles is on indicator selection or special approaches for SA when conducting an assessment for specific, and narrow-focused, applications.

It is clear that although there seems to be some indirect consideration for food security within SIA and SA, food security as a core topic is given little to no attention within this set of literature. When discussed, consideration of food-related issues in SIA and SA are narrowly focused on very specific elements of food security. Further, all articles in this set of literature are aimed at specific EA applications and not on applications to strategic-based EA. While some findings may provide insight into specific considerations relevant to food security in EA, the broad and encompassing nature of SEA, and particularly RSEA, would seemingly require a more encompassing approach for food security assessment. More research into how this might be accomplished, however, is still needed.

2.4 Food Security

A comprehensive understanding of food security is evidently lacking within EA literature. An overview of relevant food security literature is crucial for understanding how it may be effectively considered in SEA processes. One concern expressed within food security literature is that knowledge of and familiarity with advancements made within the field of food security, particularly its multiple dimensions and all that current definitions include, is largely limited to people involved directly with food security research—and does not always quickly or easily spread to other, related, fields (Gibson, 2012), as is observed in EA literature. Gibson (2012) suggests that misunderstandings of food security are due to its complex and interdisciplinary nature. Yet, he also believes that a well-informed and up to date understanding of food security is very important—as sophisticated and multi-faceted as contemporary definitions are—because food security may be easily misdiagnosed and mistreated if it is not fully understood. Ignorance with respect to new developments in food security research can pose a danger to a population's health and wellbeing if policies or programs that impact food security are carried out without that knowledge. Likewise, Hendriks (2015) suggests that addressing food

security in a manner that is not in line with holistic multi-dimensional understandings of the concept unwittingly prioritize certain elements of food security over others, providing an opportunity for degradation of important components that may, ultimately, result in intensification of food insecurity. Therefore, the failure to adequately address food security in policies or program development has potential to increase food insecurity and deteriorating public health as a result of inadequate intervention that fails to address all elements of food security.

In order to characterize the state of food security literature, this section provides an overview of the general state of food security research, important developments pertaining to the definition and understanding of food security, major theories regarding best practices for measuring food security are discussed, and food security measurement for resource development planning.

2.4.1 State of Food Security Research

Food security has received considerable attention internationally over the past few decades, with interest mounting following the global food price crisis of 2007-2008[6] (Candel, 2014). The global food crisis of 2007-2008 was the outcome of soaring food prices and resulted in a rapid increase in food insecurity, leaving many of the world's poor in dire and desperate health conditions, and sparking riots and political upheaval in dozens of countries (Clapp & Cohen, 2009; Mittal, 2009). Its impact was significant enough to mark a notable progression within the academic field of food security and appeared to function as a stimulant for heightened concern and increased demand for action among scholars and governments. Food security is now an important and prominent part of the global social policy agenda (D. Maxwell, Vaitla, & Coates, 2014), and has, notably, been identified as a priority in the United Nations Sustainable Development Goals, to which 193 nations committed in September 2015 (United Nations, 2015b).

[6] The global food crisis of 2007-2008 was the result of a drastic rise in global food prices between 2005 and 2008 caused by a number of factors, including: a decline in agricultural production growth, a decline in global grain supplies, increased production costs due to higher energy prices, and increased demand. Between 2005 and 2008 global food prices rose by 83 per cent. More specific food staples including maize, wheat and rice rose to an even greater extent: almost 300 per cent, 127 percent and 170 per cent respectively. As a result of the crisis, the Food and Agriculture Organization (FAO) estimated that approximately 40 million additional people were forced into hunger (Mittal, 2009).

Research on food security has, likewise, grown, substantially in the recent past. Food security research now covers a broad range of topics and is examined from a wide variety of angles in various disciplines. Loring and Gerlach (2015) suggest that much of the food security literature fits into four general categories: (i) "phenomenological" – concerned with the definition of food security and how it is best measured; (ii) "epidemiological" – concerned with demographics and characteristics of those that are food insecure or secure; (iii) "etiology of food security" – concerned with why people are food insecure or secure; and (iv) "intervention" – concerned with identifying intervention strategies and discussing policy that may affect food security management (p. 383). The global food crisis has intensified interest in all of the food security research fields, and while significant progress has been made in food security research since 2008, tremendous dedication to the topic several decades prior to 2008 established a rich body of literature. The complexity inherent to food security, in addition to its importance to human health, undoubtedly demands a tremendously sophisticated body of research.

2.4.2 Conceptual Evolution of Food Security

In the past, the focus of much food security literature was aimed at developing an adequate definition of food security and identifying precisely what it means to be food secure or insecure. While some debate remains about some of the more specialized definitions, there is now a fair degree of consensus amongst food security scholars on a general definition of food security (Hendriks, 2015). Compared with current definitions, early characterizations of food security were very simplistic and unidimensional. Food security was conceptualized as a policy concern at the World Food Conference of 1974, at which time it was introduced as an issue of food supply at a national or global level (S. Maxwell, 1996). Soon after, it was established that food supply of a nation, alone, inadequately addressed the issues relevant to a concept as comprehensive as 'food security' (Cafiero et al., 2014; S. Maxwell, 1996). The concept then evolved a number of times as limitations with the definition were identified. A large body of literature resulted from these efforts, and definitions of the concept ultimately stabilized in the mid 1990s. Food security is now widely understood to be a multi-dimensional, subjective phenomenon felt at an individual or household level (Coates, 2013; S. Maxwell, 1996).

The widely accepted contemporary definition of food security is broad, yet sophisticated, and consists of four primary dimensions: availability; access; utilization; and stability (FAO et

al., 2013). Although this comprehensive definition was officially presented at the 1996 World Food Summit, the four dimensions, or pillars, of food security were integrated into the concept sequentially over time, with corresponding advancements and developments reflected within the literature. Accordingly, these dimensions function hierarchically whereby each dimension builds on the previous dimension (Barrett, 2010). For example, availability of food is a pre-requisite for access; food can only be utilized adequately if it is both available and accessible; and availability, access and utilization of food are all necessary for stability. While each dimension is important independently, food security is only achieved if all four fundamental factors have been sufficiently met (Coates, 2013; Hendriks, 2015).

Food availability is arguably the original component of food security as it was introduced into the policy-arena in the 1970s and, at that time, was regarded as the sole determinant of food security (Coates, 2013; S. Maxwell, 1996; Toma-Bianov & Saramet, 2012). Early interpretations of food availability referred to a nation's aggregate food supply. Today, it is more often than not evaluated at a micro-scale and refers to the availability of food to individuals or households within a population (Coates, 2013). Food availability is now essentially concerned with the quantity of food that is available to a population or to individuals (Carletto, Zezza, & Banerjee, 2013).

Access was integrated into definitions of food security in the mid 1980s as a result of important work conducted by Nobel Laureate Amartya Sen (Coates, 2013; S. Maxwell, 1996). Sen argued that food availability did not guarantee access to food, and that access to food was more appropriately understood as an issue of entitlement (Coates, 2013). Sen is credited with triggering a major paradigm shift in thinking about food security that not only prompted the inclusion of access into the definition, but also shifted the scale of focus from a macro-level to a micro-level: focusing on households as opposed to nations. The connection between food security and poverty was also established as a result of the shift influenced by Sen (S. Maxwell, 1996). Food access initially referred to financial and physical access to food; however, social access is now also an important component of this dimension (Loring & Gerlach, 2015; S. Maxwell, 1996; Riches, 1999). Social access refers to acquisition of food in a socially and culturally acceptable, legitimate, and empowering manner (Loring & Gerlach, 2015; Riches, 1999): without the need to use food banks, food stamps or other programs that establish a reliance on government or organizational contributions (Riches, 1999, 2002), or by gathering

food using culturally important methods (Loring & Gerlach, 2015). The inclusion of culture into understandings of food security is relatively new (S. Maxwell, 1996). As a consequence of this more recent advancement, culture is occasionally overlooked within the literature. Nonetheless, its integration into understandings of food security seems to be quickly becoming the standard. Today, social, economic and physical access are all essential elements of food security's second pillar.

Utilization formally became part of the concept of food security in the early 1990s with the recognition that food quality was also an important consideration for food security as it is paramount for human health. Up until the mid 1980s, 'adequate food' was perceived as sufficient caloric intake to meet human energy requirements—nutrition and food safety were largely neglected from food security discourse. Nutritional quality, dietary diversity, and safety of food are now understood to be critical elements of food security and the dimension of utilization (Coates, 2013). More recently a cultural component has also become an important element of utilization (Hammelman & Hayes-Conroy, 2014; S. Maxwell, 1996). Culture plays an important role to both food security pillars: utilization and access. While physically acquiring food in a culturally important manner is largely an aspect of access, having culturally preferred food and being able to carry out various cultural practices surrounding food is an issue of utilization. The utilization dimension of food security is, therefore, met if people are well-nourished, have sufficient diversity of food, their food is safe and free of harmful contaminants, and they are able to partake in important cultural practices regarding food (Carletto et al., 2013; Coates, 2013; S. Maxwell, 1996).

The final dimension, stability, became a part of the food security discourse in the late 1980s, at which time it was argued that the 'security' aspect of food security was largely absent from the definition (Coates, 2013). Stability refers to the sustainability of the previous three dimensions of food security over time (Barrett, 2010). Therefore, stability addresses vulnerability and risk to economic or environmental shocks, and is additionally concerned with the degree to which people are willing to forgo present food security for future food security (Hendriks, 2015). A food stable household will not fear future food shortages and will not feel the need to reduce present food security in preparation for hardship; for example: in preparation for sudden unemployment or an accidental expense. Due to its relatively recent integration into food security definitions, stability is not always acknowledged as a pillar of food security. However, it

is increasingly supported as a fundamental dimension. In 2005, the United States Agency for International Development (USAID) formally adopted stability as a pillar of food security (Coates, 2013), and its significance to food security is now well established and reinforced in the literature (Charlton, 2016; FAO et al., 2013; Power, 2008). A multi-dimensional understanding of food security has proven to be essential to the overall concept and for adequate consideration of food security, and a requisite for successful and effective food security measurement, assessment, analysis or intervention (Coates, 2013; Gibson, 2012; Hendriks, 2015).

2.4.3 Measuring Food Security

Food security measurements are used to define the nature of food insecurity and inform intervention strategies and action. Research in this area has, as such, always been an important part of the food security literature and has evolved along with its dynamic definition (Cafiero et al., 2014). Similar to early definitions of the concept, early indicators of food security were simple in nature and estimates of food security were gathered with relative ease, since national food supply can be capture in as few as one or two outputs (Coates, 2013; S. Maxwell, 1996; Thomson, 2001). As the definition of food security became much more complex, measuring food security has become an increasingly challenging task demanding a much broader set of considerations (Coates, 2013; Thomson, 2001). Contemporary food security assessment has proven to be a difficult undertaking; falling short in its ability to capture the countless factors, determinants, and outcomes related to food security in reality (Carletto et al., 2013; Headey & Ecker, 2013). Even though research in the area continues to progress, it is not surprising that such a complex social phenomenon is difficult—if not impossible—to perfectly and accurately assess (Barrett, 2010; Coates, 2013). Nevertheless, efforts aimed to reduce food insecurity is an important and noble endeavour. Recognizing this, much of the recent food security literature is focused on investigating the validity and reliability of food security assessment approaches and strategies, as well as of specific indicators.

Over the last half century, hundreds of food security indicators have been proposed along with several differing approaches to food security assessment (Toma-Bianov & Saramet, 2012). Notwithstanding its increasing complexity, much of the food security literature in the 21st century has resulted in "an increasingly smaller and more select set of indicators that appear to be valid in many contexts", permitted in part by the relative stabilization of its definition (Coates, 2013,

p. 190). Food security indicators range in scope, form, level of analysis and purpose. While some indicators have a narrow focus and address only single dimensions of food security, others have a broader focus and address multiple dimensions. Some food security indicators have been merged to form composite indices that capture multiple dimensions—although, as Ike et al. (2015) suggest, it is much more commonplace for existing food security indicators to be unidimensional. As might be expected, certain indicators are objective and quantitative while others are more qualitative and subjective. Headey and Ecker (2013) categorize food security indicators into four classes: calorie deprivation indicators; monetary poverty indicators; dietary diversity indicators; and subjective indicators (p. 328).[7] Food security indicators may also be categorized based on which dimensions they address (see Coates, 2013).[8] While classification varies within food security literature, classification for indicators based on dimension provide a broad classification used expansively in the literature, and Headey and Ecker's classification captures the general characteristics of many of the food security indicators in use today for household and individual food security.

The effectiveness of various food security measurements, indicators and interventions continues to be heavily scrutinized and debated within the literature. This is not surprising considering the wide range of contributing factors, influences and outcomes related to food security. Nonetheless, progress has been made in the field and theories regarding general approaches to food security assessment, in particular, have more or less been harmonized within the literature.

Adopting an holistic approach to food security assessment is now a largely undisputed strategy among the international food security academic community. An holistic approach to measuring food security is one that characteristically acknowledges the inherent complexity associated with food security, and addresses its multiple dimensions in an aggregated manner

[7] Examples of indicators in each category include: (i) calorie deprivation – household or national expenditure/consumption of food; (ii) monetary poverty – household income, or expenditure/consumption data looking broadly at all household goods and services; (iii) dietary diversity – food variety score, in which the variety of food consumed by a household is captured by a simple survey counting different food items regularly consumed; and (iv) subjective indicators –an individual's feelings of hunger, or an individual's experience of anxiety over food access, availability, or any food security dimension (Headey & Ecker, 2013).

[8] Examples of indicators specific to different food security dimensions include: (i) food availability – food production within a region, or household food expenditure data; (ii) food access – food consumption survey data; (iii) utilization – food safety measurements, which may be determined by testing contaminants within the meat of an important food species, or food variety scores; and (iv) stability – months of adequate or inadequate food provisioning, or individual coping strategies (Coates, 2013).

with a focus on the most vulnerable subsets of a population (Thomson, 2001). Thomson (2001) suggests that an holistic approach appropriate for food security measurement is one that incorporates a 'sustainable livelihoods' approach, such that any analysis is people-centered, focused on the most vulnerable people, emphasizes participation, places trust in people's narratives regarding their experiences, and is multi-disciplinary. Despite challenges that persist in operationalizing an holistic approach to food security assessment, the 'sustainable livelihoods' approach is largely supported within contemporary food security literature.

To facilitate an holistic assessment of food security and a 'sustainable livelihoods' approach, it is now widely acknowledged that a suite of indicators is needed to measure the many facets or dimensions of food security. While composite indicators that measure more than just single elements of food security exist, Carletto et al. (2013) suggest that no single indicator, index or metric has the capability to measure food security fully. Researchers suggest that employment of a single indicator, or an inadequate combination of indicators, results in myriad problems including underestimation of food insecurity, inadequate diagnosis of causes and consequences of food insecurity, and unintended prioritization of food security elements (Coates, 2013; Gibson, 2012; Hendriks, 2015). An appropriate suite of indicators would therefore include a combination of indicators in which both quantitative and qualitative data is gathered, multiple dimensions of food security can be observed, and data can be analyzed from a variety of angles.

There is not, however, any one specific combination of indicators that is appropriate for food security assessment. Approaches to food security assessment vary dependant on purpose or context, and different food security indicators or combination of indicators may be more or less suited to specific applications (D. Maxwell et al., 2014). The makeup or culture of a community may also demand the use certain indicators over others; for example, an Indigenous population that relies on oral history may necessitate emphasis on experience-based indicators (Nilsson et al., 2013). A food security assessment conducted for regional planning practices would necessitate a unique approach that is considerate of the particular planning schedule, the region under consideration and the populations living within.

2.4.4 The Potential to Integrate Food Security Assessment in Natural Resource Development Planning

One challenge with integrating food security assessment into natural resource development planning is that a regional scale of analysis would generally by needed to reflect the regional scale of most natural resource development programs. Previously, it was noted that food security assessment has evolved to emphasize the local rather than global scale. Attention to regional scale analysis is far less common in the food security literature. When examining potential threats of developments to food security, a regional focus is important because impact zones, typically, extend beyond a local scale. Some scholars suggest that a regional-scale food security assessment, and subsequent interventions, should be composed of a different approach and a unique set of indicators than an assessment conducted at a household or individual level (A. D. Jones, Ngure, Pelto, & Young, 2013). The way in which indicators are selected and used, however, is largely dependent on how a region is defined. The term "region" has several different definitions in various disciplines or for various purposes. Much of the food security literature defines a region in terms of provincial, national or global political boundaries (i.e., borders) (as it is in: de Haen, Klasen, & Qaim, 2011; A. D. Jones et al., 2013; Leroy, Ruel, Harris, Frongillo, & Ballard, 2015, for example). Therefore, it makes sense that a different set of indicators, or assessment approach, would need to be employed for a regional assessment when the region does not neatly conform to political boundaries. In natural resource planning and environmental management literature, a region is much more commonly defined as a geographical or ecological region, in which direct impacts are likely to occur as a result of environmental change (Mendoza & Martins, 2006). In this context, a region may be defined as a watershed or in reference to other significant environmental features, such as the defining features of a bio-geoclimatic zone for example. The term 'foodshed' may, too, be useful in this context, providing a metaphor analogous to 'watershed' to conceptualize a system in which a populace's food comes from (Kloppenburg, Hendrickson, & Stevenson, 1996). That said, literature investigating food security assessment at a regional scale that would be relevant to natural resources planning appears to be limited to date. Liverman and Ingram (2010) explain a major challenge to a regional approach for food security assessment is that many relevant theories, methods and data are not well suited to the regional scale. Liverman and Ingram identify this "mismatch between disciplinary fields at different spatial levels" (p. 205) as a

research gap needing to be filled. But as of 2010, there does not seem to be a lot of progress in research on a regional approach to food security assessment. Research related to a regional approach to food security assessment remains sparse, and when it is discussed is discussed in terms of shortcomings. Thus, more research is needed to identify specific parameters for food security assessment at this scale, particularly given the rapid pace of large-scale natural resource development programs in northern and remote areas of Canada that host vulnerable Indigenous and other populations (Lavoie, 2018, June 30).

Food security assessments and analyses are, more often than not, concerned with estimating levels and the nature of a population's food insecurity for the purpose of developing interventions or policies to specifically enhance food security. When conducting an assessment in response to the potential impacts of development, however, the assessment bears a slightly different purpose and, therefore, requires a unique form of food security assessment. In particular, consideration for interactions, feedbacks and trade-offs need to be prioritized such that a policy response can identify and target specific elements within a system that may contribute to food security or insecurity, specifically if there is some potential for those system elements to change (Ericksen, 2008). Ericksen et al. (2009) allege that an 'integrated food systems' approach is well suited to examining threats posed to food security, specifically those arising as a consequence of environmental changes due to climate change. This approach looks at various interactions within a food system. A food system is the set of activities ranging from production through to consumption, encompassing all components surrounding food within a defined area including availability, access, utilization and stability. Therefore, an integrated food systems approach aims to identify how global environmental changes affect various components within the system, and ultimately how that might affect food system outcomes, including food security in addition to ecosystem services and social welfare – which are all innately related (Ericksen et al., 2009). While the authors believe this approach is useful when dealing with potential environmental changes resulting from global climate change, it seems fitting for assessing the impact of other environmental threats, such as those posed by proposed natural resource extraction developments because it is looking at threats and changes to the system rather than to levels of food security. The 'integrated food systems' approach proposed by Ericksen (2008) and advocated for by Ericksen et al. (2009) seems well-suited to an assessment conducted in preparation for natural resource developments, at least in part. However, more research is needed

to determine if and how this approach may be successfully utilized for food security assessment in natural resource planning, and specifically for RSEA.

2.5 Research Gap

To date, there appears to be very little research investigating how food security may be effectively addressed in SEA or RSEA. While there is some indirect consideration for food security in SEA as well as other EA literature to date, direct consideration remains limited. The literature that does exist suggests that baseline data is important when integrating health into SEA and health practitioners should be involved in the process to help analyze and interpret data efficiently. Even though both of these recommendations remain shortcomings in SEA application, they are important targets for future practice. One key issue identified within the literature is the use of general statements like 'health enhancement' that fail to acknowledge the multifactorial nature of health issues in application. Improvements to SEA processes would occur if matters of health were more explicitly and more comprehensively addressed such that impacts on all types of health determinants were considered. This finding highlights the importance of being deliberate and specific when outlining initial concerns, or valued environmental component (VECs), in order to establish a clear direction for the assessment and analysis that follows. The literature shows that direct integration of food security as a health consideration into SEA processes, while respecting its multi-dimensional nature is of paramount importance. With that said, it is clear that more research is needed to bring the topic of food security into EA and SEA discourse.

Research focused on improving food security assessment has generated a lot of traction, but with a distinct academic community 'outside' EA. In this context, significant research is being conducted at improving food security assessment and measurement. Research aimed at regional food security assessment relevant to regional environmental management planning, however, is limited. In particular, the term region is more often defined by political boundaries within food security literature, as opposed to by geographical or ecological boundaries as is more typical in environmental management practices. Additionally, literature discussing impacts or threats to food security was limited compared to that which discusses the assessment of current levels or the state of food security. One approach was identified for the purpose of assessing food security outcomes due to environmental change, but this approach is specific to environmental

change and does not provide enough evidence to support its integration within SEA processes, which looks at a wider range of threats. Food security assessment within RSEA for natural resources development in Canada would also need to be considerate of specific circumstances of remote and rural populations, and an approach to food security assessment for this explicit purpose has not yet been studied. This thesis research begins to address this gap by proposing an approach to food security assessment in a context utilized in environmental management processes. In doing so, this research will contribute food security literature aimed at improving food security assessment in applied practice. This research will, furthermore, aid in bridging two currently isolated fields of study by incorporating knowledge from the academic food security community within EA literature. The growing bodies of literature directed at improving effectiveness of both SEA and food security assessment indicate that this study will be a valued contribution to both fields of study.

CHAPTER 3

METHODOLOGY

3.1 Introduction

The goal of this research is to explore how food security may be effectively addressed in RSEA processes conducted when planning for natural resources developments in Canada. To accomplish this goal, the research design includes two phases that align with the first two objectives of this research, which are to: (i) identify key criteria and approaches for food security assessment that can be integrated within established RSEA frameworks and methodologies; and (ii) determine the extent to which food security has been considered in Canadian SEA practice to date. The methodology is largely qualitative and exploratory in nature; it employs methods commonly used in the social sciences, and in EA including interviews and a document analysis, with adoption of some quantitative analysis in the final stages of phase two. The second phase of research is partly informed by the findings established in the first phase.

3.2 Phase 1. Exploration of potential food security provisions in RSEA

This phase of research seeks to identify an effective approach to food security assessment fit for RSEA in the natural resource sector via interviews with food security experts. The goal of the interviews is to harness knowledge (approaches, criteria) about food security assessment that can inform RSEA, as the conceptual integration of these topics has not yet been explicitly studied. As noted in Chapter 2, knowledge related to the application of food security assessment exists, it simply has not yet been applied within RSEA to influence natural resources developments. Knowledge gaps in food security assessment at a regional scale and in connection to impacts to food security are less related to general food security assessment and more to the application of food security assessment to environmental management. Thus, interviews were conducted with international food security experts, defined as academics and practitioners that are contributing to the development and review of food security assessment and who have published on the topic in academic journals. Interviews took place between December 6, 2016 and February 8, 2017.

A semi-structured interview format was used to allow the researcher to explore certain lines of questioning, but also to allow the interviewee to contribute additional knowledge that

could benefit the study. Semi-structured interviews typically commence with a clear interview schedule and a list of questions to be investigated, but allow additional time and opportunities to permit the interview agenda to depart from the schedule if relevant topics are brought up by interviewees that warrant further investigation (Bryman, 2004, p. 320). This semi-structured approach was deemed most appropriate to respect the level of knowledge held by the expert participants and to provide them with flexibility to discuss and elaborate on topics they felt were important. Advancing the interviews with a pre-determined list of questions and partial structure ensured that the interviews did not depart too far from the main interview themes.

Food security experts were initially selected from the relevant literature on food security assessment. Additional food security experts were then identified using a snowball sampling method, in which interview participants were asked to identify other food security experts suitable for this study. Each participant was contacted by email or telephone, provided details of the study with a request to participate (see appendix A for a sample of the research profile), and given an opportunity to respond with questions, concerns or confirmation regarding their suitability as an interview participant. Globally, the pool of established academic food security experts that also understand environmental assessment in the context of resource development in North America is relatively small. A total of eleven experts were contacted, seven of which granted interviews. Interviewee location and residence was not a factor in the participant selection process as the nature of the interview questions were not geographically significant. Interview participants for this phase of research, thus, hail from regions across the globe, spanning four continents. Interviewee disciplinary expertise and research focus' are briefly summarized in Table 3.1.

Table 3.1 Interviewee disciplinary expertise

Interviewee	**Formal academic training**	**Research focus**
Expert 1 (E1)	ecological anthropology	food security, food sovereignty, community sustainability, and environmental change
Expert 2 (E2)	planning and sustainability	agroecological systems, sustainable food systems, and nutrition
Expert 3 (E3)	agricultural economics	food, nutrition, and public policy
Expert 4 (E4)	soil science	global environmental change, agroecology, and food system resiliency
Expert 5 (E5)	soil science and economics	agricultural development, natural resource development, global climate change, and food systems
Expert 6 (E6)	agriculture and anthropology	food security, land use, global environmental change, economic change, and international development
Expert 7 (E7)	biodiversity and conservation	Indigenous knowledge, climate change, and public policy

Given the dispersed locations of potential interviewees, interviews were conducted remotely using Skype, a software application that facilitates video and audio calls, with the exception of one interview that was conducted in person. Prior to each interview, the participants were emailed an interview schedule that included two key definitions—'food security' and 'region' (see appendix B for a sample of the interview schedule). This allowed participants an opportunity to reflect on the questions prior to commencement of the interview.

The interview questions were designed to investigate topics not readily available in the food security literature and to explore how food security assessment may fit within an RSEA framework. The interview schedule was split into three sections: (i) fundamentals of food security assessment—designed partly to set a tone for the interview and focus interviewees' line of thinking, and partly to identify key considerations and concerns around food security assessment generally; (ii) food security assessment in a regional context—in which interviewees were prompted to discuss how different geographical scales alter food security assessment and consider how spatial issues relevant to RSEA in Canada may affect food security assessment; and (iii) food security assessment within the context of natural resources development projects —in which specific issues relevant to natural resource development and the assessment of impacts to food security, in this context, were explored. Questions in the third section addressed topics that align with common stages of RSEA.

At the beginning of each interview, the participant was provided with a brief description of the study being conducted and an explanation of the purpose for the interview. Each interview participant was then informed of the ethics exception status for this research received from the University of Saskatchewan Behavioural Research Ethics Board. The interviews lasted between 45 and 90 minutes each and were digitally recorded to .mp3 format on two separate devices. At the conclusion of the interviews, the recordings were immediately backed up to a disk drive to avoid loss of data. Interviews were then transcribed, verbatim, into a Microsoft Word document.

Commensurate with standard qualitative data analysis procedures, the data gathered in this phase of research was analyzed by means of thematic analysis, in an inductive manner. The specific approach used for analysis in this phase of research largely follows a step-by-step approach presented by Attride-Stirling (2001). Attride-Stirling's thematic network analysis method builds off of many previously established methods for qualitative analysis that provide tools to identify themes from raw data, wherein a more formulated and detailed set of thematic

networks are developed. NVivo© version 12 software was used to aid in the coding process, such that codes and labels could be easily organized and sorted for further analysis. Attride-Stirling's thematic network analysis process was employed for this research because of its clear, systematic and structured design, providing an approach to analysis that is reproduceable and defensible. Attride-Stirling's thematic network analysis follows a 6-step process, as follows:

1. Coding: The process of breaking down or 'dissecting' the data into segments and designating those pieces of text with labels, or 'codes'. Prior to coding, a coding framework must first be established to inform how coding, and further thematic analysis, is carried out. For qualitative research, the most common coding frameworks are inductive and deductive analysis; inductive thematic analysis involves the development codes and themes that are derived directly from the data, as opposed to deductive thematic analysis, which uses pre-established codes or theories to frame theme development (Attride-Stirling, 2001; Braun & Clarke, 2006).
2. Theme identification: Themes are developed as patterns emerge from coded data and are derived from a collection of related codes. Theme development will often follow a series of refinement stages, so that a manageable number of themes that clearly and concisely summarize the data result.
3. Network construction: Networks are the result of first arranging and rearranging themes into levels based on how broad or encompassing they are and then illustrating how the various themes connect to one another or support larger, more comprehensive, themes or claims, in a web-like manner.
4. Description and exploration of thematic networks: Networks are explained by going back to the raw data to support the contents of the networks and exploring patterns that emerge. This step involves the incorporation of examples over mere description. One purpose of this step is to aid the interpretation of patterns for summarization, but also to present how inferences were made to the reader.
5. Summarization: Principal themes and their underlying patterns are summarized—described explicitly and succinctly.
6. Interpretation: Theme summaries are then discussed apropos of relevant theory. This step re-addresses the research question.

Results from this phase of research were used in the following phase to explore and evaluate current SEA practice in Canada.

3.3 Phase 2. Exploration of food security considerations in Canadian SEA practice

The goal of this phase of research is to determine the extent to which food security is currently being considered and/or addressed in Canadian SEA and the extent to which consideration reflects recommendations made by the experts in phase one of the methodology. It is clear that there is a gap in academic research regarding food security in SEA, given the lack of literature that exists. It is also important to substantiate the extent to which food security may be considered in practice, as practice and theory do not always align (Gunn & Noble, 2011; Lee, 2006), and to establish the basis of consideration for food security, including current strengths and weaknesses in its considerations and opportunities for improved integration. The extent and means to which food security is currently addressed within SEA has not been explored to date, even indirectly.

To accomplish this phase of research, a document analysis was performed. Document analyses are used to decipher meaning and gather empirical knowledge from existing documents through systemic examination (Bowen, 2009). Document analysis is a common research method for the analysis of EA processes as it provides extensive and dependable information about the state of the practice (Douglas et al., 2011; T. Fischer et al., 2010; Noble & Bronson, 2005).

SEA reports examined in the document analysis were sourced from federal-provincial offshore petroleum boards as they were some of the only publicly accessible Canadian SEAs available for review. The Canada-Nova Scotia Offshore Petroleum Board (CNSOPB) and the Canada-Newfoundland and Labrador offshore Petroleum Board (C-NLOPB) have conducted a number of SEAs for potential issuance of petroleum exploration rights and associated petroleum exploration activities. For this research, a total of 17 SEAs were selected, 11 conducted by the CNSOPB and six by the C-NLOPB. The SEA study areas varied substantially in size from approximately 9,000km^2 to 680,000km^2, with a median study area of approximately 46,000km^2. Study areas were located various distances offshore from coastlines up to the 200-mile limit: the jurisdictional boundary for federal-provincial offshore petroleum boards. Although a study area was defined, the areas studied were not confined to the study areas identified in the SEAs; consideration was given to adjacent areas to account for potential interactions with valued

ecosystem components (VECs). Offshore oil and gas activities typically examined in the SEAs included: geophysical surveys, offshore well drilling (exploratory and delineation), oil and gas production, potential emissions from offshore drilling and production, and potential accidental events and malfunctions. Table 3.2 provides a list of the SEAs analyzed and the year they were completed (a map with the approximate location of each SEA region of study is located in appendix C).

Table 3.2 SEA reports selected for document analysis

No.	SEA Region	Proponent	Year
1	Eastern Sable Island Bank, Western Banquereau Bank, the Gully Trough and the Eastern Scotian Slope	CNSOPB	2003
2	SEA Laurentian Subbasin	C-NLOPB	2003
3	Misaine Bank	CNSOPB	2005
4	Sydney Basin	C-NLOPB	2007
5	Labrador Shelf	C-NLOPB	2008
6	Southern Newfoundland	C-NLOPB	2010
7	Southwestern Scotian Slope	CNSOPB	2011
8	Eastern Scotian Shelf - Middle and Sable Island Banks (Phase 1A)	CNSOPB	2012
9	Eastern Scotian Slope (Phase 1B)	CNSOPB	2012
10	Misaine and Banquereau Banks (Phase 2A)	CNSOPB	2013
11	Eastern Scotian Slope (Eastern Portion) and Laurentian Fan (Western Portion) (Phase 2B)	CNSOPB	2013
12	Western Scotian Shelf (Phase 3A)	CNSOPB	2014
13	Western Scotian Slope (Phase 3B)	CNSOPB	2014
14	Western Newfoundland and Labrador	C-NLOPB	2014
15	Eastern Newfoundland	C-NLOPB	2014
16	Sydney Basin and Orpheus Graben	CNSOPB	2016
17	Middle Scotian Shelf and Slope	CNSOPB	2019

The Atlantic Canadian marine ecosystem is rich in biodiversity, considered to be one of the most productive marine environments in the world (Fisheries and Oceans Canada, 2018). The physical environment is diverse, as water depths range from several meters to several thousand, and a broad and diverse assemblage of marine species are, thus, prevalent within the SEA study areas. A range of human activities take place within the SEA offshore regions, including, but not limited to: oil & gas exploration and extraction; fisheries (commercial, Aboriginal, recreational and subsistence); tourism (i.e. bird and whale watching, boating); research; and military activities. With respect to food security, small scale fisheries have historically played an important role in food security outcomes of coastal Atlantic Canadian communities, and remain so to this day (Lowitt, 2014).

Although focused in a single sector and within eastern regions of Canada, the SEA reports conducted for offshore petroleum development are a suitable and, arguably, ideal sample of Canadian SEAs for this research phase objective. However, examining SEAs that are likely to integrate food security considerations, due to the importance of the region to food security, should presumably produce telling conclusions about the manner to which it is addressed. Concerns surrounding the negative impacts resulting from offshore petroleum development are numerous and long-established (see Bakke, Klungsøyr, & Sanni, 2013; O'Rourke & Connolly, 2003). While food security may not be the express focus of many related impact studies, a large number of the established impacts from petroleum development—including: ecosystem destruction, contamination of surrounding land and water, or harm to animal populations, for example (O'Rourke & Connolly, 2003)—directly and negatively impact food security (Ziervogel & Ericksen, 2010). Additionally, the interaction between the offshore oil and gas industry and fisheries, a significant coastal activity, is substantial (Cowan & Rose, 2016; Rouse, Hayes, & Wilding, 2020). Fisheries losses from oil and gas infrastructure and activities include gear loss and damage, loss of fishing access, loss of fishing time, spoilt catches, and injuries or fatalities (Rouse et al., 2020). On the other hand, there is also a potential benefit from offshore petroleum to the financial access element of food security to nearby communities. Rudolph et al (2015) suggest that wage earning benefits to nearby communities has some potential to offset negative impacts of good practice offshore petroleum. The authors do additionally note, however, that financial benefits are more pronounced as geographical distance from the development increases. Nevertheless, with the impacts from offshore petroleum development to food security being so significant, positive or negative, it is presumable that SEAs conducted for petroleum related developments would be some of the most concerned with food security, and therefore provide a good source of data.

To carry out the document analysis, a scan of the SEA reports was necessary to find pertinent data segments within the larger documents. SEA reports are comprehensive studies that can be hundreds or even thousands of pages long, and an exhaustive and thorough analysis of such documents has the potential to be impractical. For the purpose of this study, it is unlikely that pertinent information would be included throughout the entire documents; therefore, a word search scan was employed to locate potentially relevant sections of the document. The word search was executed using NVivo© version 12 software to rapidly locate words related to food

security, its multiple dimensions and food security assessment (see appendix D for document analysis framework, which includes a detailed list of words used in the search). Sections containing the words were reviewed to determine their significance to the research question; relevant sections were then catalogued for further analysis. Scoping documents were also reviewed for the analysis. Scoping is one of the first stages of EA processes, in which objectives and criteria are established that guide the remainder of the assessment process (Dalal-Clayton & Sadler, 2005a; Mulvihill & Jacobs, 1998). The scoping stage of SEAs establish priorities and, often, identify concerns to be prioritized (the VECs) that are given special attention in future stages of the assessment. Relevant VECs to food security were noted during the review of the scoping documents and sections pertaining to those VECs, within the full SEA reports, were also catalogued for further analysis.

Qualitative document analysis, generally, combines techniques used in structured content analysis and thematic analysis (Bowen, 2009). Therefore, following techniques common with structured content analysis, this research organized information within the document into objective and pre-defined categories (Bryman, 2004). Categories were based on the four standard dimensions of food security as well as on issues (identified in phase one interviews or within the literature) as important components of food security. Additional categories were established following phase one of research, to include any additional components important to food security assessment in RSEA context, as established by food security expert interview participants. NVivo© version 12 was again used to code and organize data for further analysis. The analysis adopted a thematic analysis approach, which is customarily employed in qualitative research to decipher latent meaning from content (Bowen, 2009), content was additionally evaluated using magnitude coding to substantiate the level and means of consideration for food security by applying the data to a magnitude scale. Magnitude coding is occasionally used in qualitative inquiry to quantify qualitative data, permitting an expression of presence, intensity, frequency or evaluative content (Saldaña, 2016).

Thematic analysis was applied to this phase of research because it was presumed that elements of food security may be addressed indirectly or latently within the SEA reports used for this research. The principal difference between the thematic analysis for this phase of research compared to phase one was in the coding framework employed. Organizing and analyzing data

based on pre-established categories are deductive in nature and distinguish the character of the thematic analysis employed in this phase from that taken in phase one.

The organized content was then evaluated using scales to define the level to which pre-established criteria were met. The evaluation criteria were established following phase one of research and are therefore discussed in detail in the following chapters; withal, the criteria were based on the four dimensions of food security and procedural requirements for effective food security assessment. The use of magnitude scales was based on an approach adopted by Fischer (2002) in which SEA documents were evaluated on the level to which they met pre-established performance criteria. Fischer employs a three-point scale to define whether an SEA document met, partly met or did not meet a performance criterion. For the consideration of food security, use of a greater number of scale points was deemed necessary to help discriminate between the large variation observed within criteria considered 'partly'. For instance, a five-point scale was utilized to classify how well each SEA considered eight elements of food security. Each of the five scale points were allocated a label and a numerical rating, or score, from 0-4; the scores permitted some quantitative analysis, while the labels contextualized the level of consideration. The five scale points were as follows: 0 – not at all considered; 1 – rarely considered; 2 – somewhat considered; 3 – largely considered; and 4 – fully considered. A second 4-point scale was used to evaluate the level to which the SEAs met public participation recommendation criteria established in phase one. The four scale points and scores utilized were as follows: 0 – does not meet the recommendation criteria; 1 – minimally meets the recommendation criteria; 2 – somewhat meets the recommendation criteria; 3 – meets the recommendation criteria.

3.4 Limitations

With any form of research, a number of potential limitations arise. Qualitative research, in particular, has been subject to criticism in the past concerning its reliability and validity as a form of research (Cope, 2014). Common criticisms of qualitative research include the following: (i) it is too subjective, and subject to researcher interpretation; (ii) replication of the research is difficult if not impossible as a consequence of researcher interpretation; and (iii) a lack of transparency is common, as it is often hard to discern how conclusions were made (Bryman, 2004). Qualitative research characteristically requires some degree of interpretation in analysis, and many of the common concerns are, therefore, potential limitations with this research.

Additional limitations or concerns specific to this research may arise out of interview question design, interviewee sample size adequacy, and document selection. Nevertheless, significant effort was made to minimize the potential limitations for this study; described below.

Inadequate question design is a commonly expressed potential limitation with qualitative interviews, particularly in regard to the potential for lack of clarity and, thus, potential for subjective interpretation by interviewees (Turner, 2010). For this study, this limitation was addressed by administering a pilot interview. A pilot interview, or test interview, can help identify inadequate question design (Turner, 2010); for this research, immediately following the first interview, the interviewee was asked to provide feedback on the clarity of the questions and the style of the interview. A couple, albeit minor, suggestions were made on how questions may be adjusted for clarity. The professional and academic nature of the interview participants also contributed to minimizing limitations associated with the interview process because their understanding and familiarity with academic research processes, and with the purpose of the interview was well established prior to commencement of the interview. The application of the interviews and document analysis, additionally, follow a standard and simple design formula, thereby reducing limitations in initial data collection and examination stages.

The interview sample size of seven may potentially be interpreted as a small sample size and open to limitations associated with insufficiency in sample size selection in research (i.e., generalization of results or lacking validity). Nevertheless, it is well established in scholarly review that fewer participants are needed in qualitative interviews when: quality of data provided is rich; information power provided by participants is high; participants are homogenous in nature; questions are more open-ended and able to provide a richer set of data; and when the scope of the study or nature of the topic is simple and straightforward (Vasileiou et al., 2018). The expert nature of the participants, richness of the data provided by the interviewees, open-ended nature of the interview question design, and relative simplicity of the research objective all suggest a smaller sample size is acceptable. Additionally, a point of 'data saturation' was achieved by the seventh interview. Data saturation is the point at which no additional information is found—when codes are repeatedly used, but no new codes are being produced (Saunders, 2018)—and is a widely recognized principle for determining sample size sufficiency (Saunders, 2018; Vasileiou et al., 2018).

Qualitative research characteristically requires some degree of interpretation in analysis stages, however, applying Attride-Stirling's thematic networks analysis method to phase one and the systematic design of magnitude coding to phase two aimed to reduce, chiefly, the concerns surrounding difficulty in replication and lack of transparency. Attride-Stirling's method follows an explicit step-by-step process that provides a systematic and methodical approach, in which analysis is, theoretically, carried out in a reproduceable manner. This method also integrates a number of steps intended to illustrate and describe how conclusions were formed, thereby addressing transparency concerns. A magnitude coding method additionally provides clear evaluative criteria to the coding framework, thereby enhancing reproducibility. Nonetheless, some potential for researcher bias in interpretation remains.

Researcher bias can impact inferences and conclusions, particularly when applying inductive research methods as they characteristically require inference (Chenail, 2011). The potential for researcher bias is also present with document analysis. Many documents, including SEA reports, are not produced for research purposes; therefore, may not provide sufficient detail for a particular research problem. Some of the information within documents may be subject to interpretation by the researcher, or pertinent information may, alternatively, be left out. This highlights the potential for the inappropriate exclusion or interpretation of information during document analysis due to researcher bias. Efforts were made when carrying out this research to mitigate researcher bias by adopting a critical eye and checking the selection criteria for the document analysis regularly. Consultation with a senior advisor and other researchers also helped address the potential for researcher bias. Additionally, applying a quasi-quantitative analysis, where frequency of themes and ideas are presented when discussing results of the analysis adds a level of transparency, and this necessitated a more deliberate and methodical approach by the researcher.

Potential limitations in assessing SEAs within a single natural resource sector and region for food security consideration also arise from this research. The focused selection of offshore petroleum SEAs was a consequence of restrictions and limitations encountered when acquiring Canadian SEAs for this study. The offshore regions examined in the SEAs do not physically accommodate onshore human communities; therefore, the social environment is only important to the study to the extent that there is interaction. The separation may provide a sense of license to only superficially incorporate social issues in the SEAs. Alternatively, the level of interaction

between the human population and the offshore region for food security may be more limited than a more complex onshore region that includes a variety of ecosystems (i.e., lacustrine, riparian, forest, agricultural). Furthermore, SEA practice may vary region to region based on differences in regulatory regimes, as well as sector to sector. Thus, it is possible that consideration for food security may be more or less prominent in SEAs conducted for shale oil extraction development in the Yukon, for example, than for Atlantic offshore petroleum extraction. Nevertheless, this research provides a first glimpse into food security consideration in Canadian SEA practice. Additional research would be needed to identify the level of consideration for food security in other sectors of resource development and other regions across Canada or globally.

CHAPTER 4

PHASE I RESULTS AND DISCUSSION

This chapter presents the results and subsequent discussion that emerged from phase one of the research, i.e., semi-structured interviews with food security experts. The findings from the interviews provided insight into key criteria for food security assessment in a context specific to RSEA: environmental management planning for natural resources development in a regional context. Interview data analysis revealed two predominant themes: (i) essential components required for effective food security assessment in the context of RSEA; and (ii) analytical approach requirements for food security assessment within RSEA processes. Thus, the chapter commences with an overview of the results and discussion related to each theme and concludes with the criteria for food security assessment in RSEA suggested by food security experts to inform the document analysis in phase two of research.

4.1 Essentials for Effective Food Security Assessment in RSEA

Essential components for effective food security assessment are generally well studied in food security literature; however, it was hypothesized in chapter two that the application of food security assessment within an RSEA process may comprise a slightly different set of ingredients given the distinct context and scale of RSEA. Interestingly, a majority of interviewees identified food security essentials coincident with what is expressed in food security literature. The 'sustainable livelihoods' approach (Thomson, 2001), introduced in chapter two as an approach to food security assessment that is integrative of various recommendations directed at effective assessment, aligns with much of what the interview participants suggested; such that assessment of food security should: adopt a multi-disciplinary approach that is focused on the vulnerable populations; be participatory and engaging with the public; focus on assets within a community; and focus holistically on social, economic and environmental issues. However, an insightful finding from the interviews was the emphasis on specific elements of food security assessment. Furthermore, the food security experts provided additional elements to consider in the context of RSEA that go beyond those captured in the literature. Five key themes emerged from the interviews related to essential elements of food security assessment for RSEA. Specifically, food

security assessment for RSEA must: (i) encompass a holistic understanding of food security such that its multiple dimensions and component parts are integrated into RSEA processes; (ii) understand food security from a location and culture specific context; (iii) use a suite of indicators to capture the multi-factorial nature of food security, selected following exploration of context-specific topics; (iv) integrate meaningful public engagement; and (v) focus on vulnerable populations. Explanations of each theme follow below.

4.1.1 Holistic understanding of food security

All seven interviewees expressed that food security is a complex problem with a wide range of contributing factors and stressed the importance of acknowledging its complexity by adopting a holistic understanding of food security. This perspective aligns with food security literature, where a holistic understanding of food security is considered fundamental (discussed in chapter two). When considering an approach to food security assessment in RSEA, interviewees were largely of the same opinion: that the assessment be holistic and considerate of the multiple food security dimensions.

In a slight departure from the general consensus, one interviewee (E3) suggested it might be better to look at a less complex problem, like that of sustainable healthy diets, but acknowledged that if food security was the focus, then multiple issues and components would need to be examined. In contrast, five of the seven interviewees (E1, E2, E4, E5, E7) explicitly cautioned against focusing too narrowly on individual aspects of food security, emphasizing that food security assessment needs to be comprehensive. For instance, one interviewee, expressed:

> All of these different pieces need to be considered in order to understand what trade-off decisions are being made … Without all this information, without understanding food security, we can't possibly have a true assessment… all these pieces make it up (E7).

In the same vein, the interviewees expressed that it is important to consider all dimensions and components of food security definition for any assessment that includes food security in order for it to be complete. One interviewee said:

> Be aware. You've got to be specific on what is meant by the state of food security, because in our definition all of our words could be addressed 10 out of 10 but one, so by definition food security is not met (E4).

Another interviewee insisted that "if any piece of the dimensions does not exist, then food security does not exist" (E5). Many interviewees agreed that failing to acknowledge all aspects

of food security could be harmful when intervention or policy decisions are made (E1, E2, E3, E4, E5, E7).

The interview results and the food security literature support the importance of considering each component of the food security definition as critical for adequate consideration of food security, as well as for effective food security assessment and subsequent intervention. For example, one interview participant indicated that "this whole analysis is hinged on the definition of food security and our understanding of what it means" (E4). Additionally, the vast amount of literature focused on the conceptual understanding and definition of food security points to the importance of integrating its many components as fundamental to the food security community (see Coates, 2013; Gibson, 2012; Hendriks, 2015; S. Maxwell, 1996). Coates (2013) suggests that the course of research contributing to the particular, yet encompassing and holistic, definition of food security "should be applauded" (p. 188). An important finding emerging from the interviews was the emphasis placed on carrying out an assessment component by component, or regularly referencing the food security definition. Therefore, a condition for effective integration of food security assessment in RSEA would include a holistic, systemic, breakdown of those components of the definition.

4.1.2 Context specific

All interviewees emphasized that food security manifests differently in different locations and contexts and maintained that context is critical in food security assessment. Factors such as culture, physical environment, previous economic development, social history and political system were common topics raised in the interviews to explain why context plays such a major role in food security—all factors critical to a food security situation and food security outcomes. For instance, one interviewee asserted: "It's possible that you have overarching guidelines, but the answers look different as you go across scales… how things change is going to be different in different environments" (E7). Another interviewee simply stated: "We need to understand the environment for which we are going to collect data" (E3). Furthermore, the seven interviewees decisively stated that consideration for a wide range of context specific issues is fundamental in order to adequately understand a food security situation, aligning with the importance of adopting a holistic understanding of food security. This is not incongruent with food security literature; however, the context specific nature of food security seems fundamental to the concept

and not as clearly delineated. The notion that food security, in application, is ultimately context specific is essentially implied within the concept. Consequently, much of the food security literature seems to be focused on case studies to explore particular food security challenges (for example, Pelletier, Hickey, Bothi, & Mude, 2016 provide an overview of case studies directed resliency and food security for rural communities).

The interviewees' emphasis on the importance of context seemed consequential of an underlying concern that the application of an impact assessment process may commence with pre-conceived ideas of what contributes to food security without understanding actual food security manifestation or circumstances. This concern was directly addressed in couple of the interviews (E2, E3); for instance, one interviewee explained: "if we don't understand how these households operate, we can do all kinds of econometrics, but it's probably going to be wrong" (E3). Akin with research on nondiscriminatory assessment, the importance of evaluating data within a given context is well established, recognized as critical for responsive, fair, equitable, unbiased and effective decision-making processes (Ortiz, 2002).

The interviewees were eager to provide an assortment of specific considerations that could apply within a RSEA application (summarized below in Table 4.1). The context specific topics provided by the interviewees for assessing food security were not inconsistent with food security literature. Several similar topics are emphasized as critical for food security assessment within the literature, including, but not limited to: purchasing power of households; food preferences; religious practices surrounding food; food production; consumption patterns; dietary diversity; and nutrition of food consumed (Charlton, 2016; Ericksen, 2008). However, the specific issues provided within the interviews were largely referential to a regional scale analysis for the purpose of assessing impacts. Therefore, the context specific topics raised in the interviews inform the development of a conceptual framework for considering food security specific to RSEA and provide a blueprint of potential topics and assessment criteria.

Table 4.1 provides a summary of all the context specific issues that emerged from the interviews, including considerations details pertinent to each topic. The most significant context specific topics to emerge from the interviews, based on the number of responses, included those pertaining to a population's: food system; health situation; behaviours; culture and value systems; and socio-political environment. These five topics are discussed in detail, below, and provide an elemental understanding of how various topics would be considered within a food

security assessment for RSEA. While only the first five topics are further detailed, it was clear within the interviews that a broader assortment of topics are required to align with the holistic nature of food security; all the issues outlined in the table below should be, at least briefly, considered when moving forward a food security assessment in RSEA.

Table 4.1 Context specific considerations important to food security assessment

Context specific issues	**No. of respondents**	**Issue related consideration details raised during interviews**
food system details	7	diet and consumption patterns; food diversity and variety; food sources; food production/productivity; acquisition methods; movement of food; food trading or sale
human health situation and outcomes	7	malnutrition indicators; caloric intake; nutritional status; food-related disease; somatic disease; mental health
culture and value systems	6 (E1, E2, E3, E4, E5, E7)	culturally important food species; culturally significant harvest/acquisition methods; cultural practices surrounding food; general cultural practices; locations of cultural importance; religion and religious practices involving food; prevailing values; ceremonies or food celebrations; traditional diet
household behaviours	6 (E1, E2, E3, E4, E5, E6)	consumption patterns and food choices; preferences; food acquisition methods and behaviours; food preparation; food celebrations; cultural practices surrounding food; household dynamics and domestic prejudice
socio-political environment	6 (E1, E2, E3, E4, E6, E7)	social issues and prejudices; political environment; regulatory history; culture and value system; household behaviour; formal institutions; government characteristics; community cohesion; emergency supports; case law; demographic information; social capital
agroecosystem characteristics	5 (E1, E2, E5, E4, E6)	ecosystem characteristics; ecosystem services; agroecosystem productivity; climate change issues
social and cultural histories	5 (E1, E2, E3, E4, E7)	colonization history; traditional diet and practices; historical food system; historical access
socio-economic situation and household assets	5 (E1, E2, E3, E5, E6)	labour productivity; household income; household savings; food prices; livelihood strategies
seasonal variation and pressures	3 (E1, E3, E5)	seasonal diet variation; seasonal issues and hardship; seasonal changes to household behaviour and practices; seasonal changes of the food system
water security and sanitation details	2 (E3, E5)	access to clean water; sanitation access and practices; water supply of the ecosystem

Food system. Components of a population's food system are standard aspects of food security, overall. A food system is typically understood as a set of activities involved in food

production to consumption, source to mouth; however, it is occasionally understood more broadly to also include interactions that influence those activities, and outcomes of those activities (Ericksen, 2008). A food system is characteristically the heart of food security (Capone, El Bilali, Debs, Cardone, & Driouech, 2014). That understanding was clearly expressed within the interviews, as direct reference to a "food system" or "food systems" was made in all seven interviews. Similarly, it was underscored in the interviews that a food system is inherently context specific since it consists of details for a particular, environment and population. For example, one interviewee noted: "Food systems are so different from place to place whether its seasonal differences or food differences or traditional practices" (E1). Stemming from that understanding, all interviewees expressed the need to assess specific regional aspects of a population's food system in an RSEA process. One of the interviewees succinctly expressed the message, asserting: "first you start with your food system" (E3). It was clear from the interview data that consideration for food system details is a key component for effective food security assessment in RSEA. Chief food system elements discussed in the interviews included: diet and consumption patterns; food diversity and variety; food sources; food production/productivity; acquisition methods; movement of food; and food trading or sale patterns.

Human health situation. All seven interviewees expressed that a basic understanding of the human health situation for a population under assessment was an important aspect of a food security assessment—largely as an indicator of a population's food security or insecurity status and vulnerability. For instance, one interviewee commented: "health indicators suggest that you're not food secure, or you are, so why aren't you, lets understand this more" (E1). It was evident in the interviews that health was regarded as a priority since it is a fundamental food security outcome. Comments such as the following were not unusual: "if you're going to give food security it's due in terms of how important it actually is, it needs to be considered within that public health aspect" (E2).

A variety of diet-related health indicators were also noted as important considerations to include in a RSEA food security assessment—notwithstanding the notion within the interviews that indicators should be determined following an initial assessment of a population's specific food security (discussed further in section 4.1.3). Malnutrition, caloric intake, nutritional status, food-related disease outcomes, somatic disease outcomes, and mental health issues were all discussed in the interviews pertaining to health outcomes and indicators relevant to food security.

More specifically, health indicators such as BMI (body mass index), prevalence of cardiovascular disease, prevalence of diabetes, prevalence of certain types of cancer, vitamin A deficiency, birth weights and prevalence of low birth weight, child stunting, and prevalence of depression and anxiety, were all brought up as potentially important indicators of the human health situation as it relates to food security.

Culture and value system. Culture and value systems were understood as contributing to a major underlying factor regulating and guiding household behaviour. Six of the seven interviewees heavily stressed culture and value systems as a central factor influencing food security (E1, E2, E3, E4, E5, E7). One interviewee very concisely and explicitly expressed the importance of incorporating culture in RSEA, insisting: "culture is an interlinking system with all the other systems within that environment … cultural issues have to be considered" (E7). Other interviewees provided more details on why culture is so important. Three of the interviewees directly suggested that culture needed to be assessed and understood because a logical or scientific understanding of what food security should look like for a community is inadequate and may not necessarily propagate food security (E2, E3, E4). For instance, one interviewee alleged the following:

> Giving people information from the scientific perspective and ignoring that cultural importance that's in place, I think can lead to a situation where you [those potentially impacted communities] are not going to take seriously the actual science because it doesn't fit into your worldview and how you live your life (E2).

Another interviewee noted: "some of the wild food sources are hugely important for religious purposes, more than, or beyond, nutritional value is spiritual value; and that is why the introduction of the word social access and food preferences is important" (E4).

Consideration for species of cultural importance, whether for eating or other cultural practices, was directly discussed as important in five of the interviews E1, E2, E3, E4, E7). One interviewee illustrated this in the following quote:

> I would want to look at something in terms of, say, cultural keystone species… let's say salmon is a cultural keystone species. It's important in multiple dimensions, economically and so forth, that would have to be one thing that would have to be represented in indicators (E1).

It was clear that majority of food security experts believe culture should be considered as a chief consideration factor in any food security assessment process.

Details surrounding specific considerations related to culture and value systems mentioned in various interviews included: culturally important food species; culturally significant harvest/acquisition methods; cultural practices surrounding food; general cultural practices; locations of cultural importance; religion and religious practices involving food; prevailing values; ceremonies or food celebrations; and traditional diet.

Household behaviours. Six of the seven interviewees expressed the importance of incorporating household behaviours into a food security assessment for RSEA (E1, E2, E3, E4, E5, E6). Although the word "behaviour" was only directly mentioned in one interview, the theme was established from the emphasis placed on aspects of behaviour, more general than culture and values. One interviewee, for example, expressed: "I'm quite surprised where some people's foods actually come from, especially in an urban context when you expect everyone to rely on an income, but there's a lot of bartering and trading and other things outside the formal economy" (E2); another interviewee accentuated:

> That process, that understanding, of how people are sort of negotiating that process: are they canning, are they freezing food, are they drying it or not, and why? That aspect I would say is the next important consideration for addressing food security (E1).

More directly, one interviewee stressed: "A lot depends on the behaviour of the household, and a lot depends on the environment within which behaviour takes place" (E3). In regard to household behaviour, factors that were highlighted as important included: consumption patterns and food choices, food preferences, food acquisition methods and behaviours, food preparation, food celebrations, cultural practices surrounding food, household dynamics and domestic prejudice.

Socio-political environment. The importance of considering the socio-political environment in a food security assessment for RSEA was discussed in six of the seven interviews (E1, E2, E3, E4, E6, E7) and was emphasized in five (E1, E2, E4, E6, E7). Key factors discussed as important components of the socio-political environment influencing food security included: social issues and prejudices; the political environment; regulatory history; formal institutions; government characteristics; community cohesion; emergency supports; relevant case law; demographic information; and social capital. Culture and value systems, as well as household behaviour were also discussed as issues related to the socio-political

environment; more explicitly related to larger social and political influences, as opposed to the more general context that was described in the subsections above.

Five of the seven interviewees noted that the political environment could set the foundation for food security, or alternatively: be prejudicial, or destructive to food security efforts (E1, E2, E4, E6, E7). One interviewee, for instance, outlined a number of potential political forces that could impact food security, with the following excerpt:

> Look at what the policies say. What are the social circumstances that are going to generate food insecurity or give people the space to innovate, respond, adapt, or whatever? Do they have authority? Do they have the space to experiment? … If you're talking about Indigenous peoples, look at case law. What's the case law and statutory basis for the right to fish, or the right to hunt, or the right to access that piece of land versus this piece of land over here. Then at least you know the framework at which people are experiencing hardship and responding to it. Then you can get a better sense of, or at least direct you to the places that you're more likely to encounter more food security or insecurity over time than other places in the world (E1).

The influence of the social environment was also underscored in five of the interviews. Most significantly, social prejudices and prejudicial histories were discussed as factors that play a major role in food security outcomes. For instance, one interviewee suggested:

> Most of these communities are already in a food impoverished or food insecure state, and there's lots of reasons for that, right? Previous development, colonialism, all various social issues that sort of induce poverty in remote communities, whether First Nations or otherwise (E1).

Similarly, another interview participant pointed out that social prejudice was an essential consideration within the concept of food security, evidenced in the following statement:

> The notion of social access was to help the notion of allocation society as some cultures, many for women, in others its different social castes, lower pecking order. So, that social access isn't just about economic and physical access, it might be that there is a social barrier to getting food (E4).

It was evident that the participants felt that an understanding of the social situation within a region was critical for food security assessments in order to gauge social barriers and opportunities.

In addition to understanding the foundation to which food security may or may not be bolstered or hindered, the interview results revealed the importance to gauge where and how socio-political environmental impacts are felt within the communities under assessment and to better understand who within the population might feel the burden of negative impacts from

industrial resource development. In this regard, one interviewee suggested that the following questions should be addressed in the food security assessment: "Who is bearing the cost [of impacts]? As opposed to over the long-term, who is reaping the benefits? That's a social justice question" (E1). Interviewees suggested that understanding the socio-political forces at play in a food system is crucial to understanding the food security situation and social vulnerability.

Another manner to which some participants felt the socio-political environment was important to assess in RSEA was consequential of their concerns that socio-political influences and prejudices may influence the food security assessment process itself (E2, E6, E7). For instance, one interviewee questioned the potential challenge in gathering accurate data due to social conditions or prejudice, outlined as follows:

> An evaluation by social services to try to capture within family distribution issues that may be hidden by a data collection exercise that operates at the household scale. I would be worried, for instance, that someone would say this is all fine this is great, but there is a grandmother at back that is reliant on country food and that their food security pathway might not be captured or reflected in a household survey (E6).

Another participant, likewise, implied that indicators may be biased, in favour of the privileged, when pondering: "Who is defining indicators, and under what value system is defining it as an indicator?" (E7). It was conveyed in the interviews that understanding socio-political forces at play in a given environment may also help to reduce bias and limitations that might otherwise hinder food security assessment efforts.

Impressions of context specific topics. With respect to criteria and context specific issues for consideration, none of the topics emerging from the interviews are novel to food security research. Food security literature includes many examples of studies that affirm the need for inclusion of all the topics outlined in Table 4.1 (for example, Burchi & De Muro, 2016; Capone et al., 2014; Coates, 2013; Loring & Gerlach, 2009). Nonetheless, it is informative that the topics were discussed in the context of this research and help elucidate criteria for the application of food security assessment within RSEA. Additionally, the interview data clearly delineated that context is key for understanding not only food security manifestation, but also for understanding vulnerability, where impacts may be felt, and the weight of those impacts—which are core objectives of an impact assessment at its most primitive level (IAIA, 2009).

4.1.3 Indicators selected following an initial food system characterization

All of the interview participants insisted that a broad suite of indicators be employed in a food security assessment to effectively investigate the wide variety of assessment criteria. Similarly, all seven interviewees implied that food security requires a combination of objective and subjective indicators, as well as a collection of quantitative and qualitative data. Five of the interviewees were quick to note that single indicators were much too narrow to capture the complexity of food security, often skewed toward certain dimensions of food security potentially undermining the assessment from the outset (E1, E2, E3, E5, E6). One participant, for instance, stated the following:

> A challenge with indicators, and food security assessments are, generally, in my experience, skewed toward one particular indicator. They either focus too much on whether or not, on how much people are harvesting or how much people are buying, or they focus on how much land, or they focus on property rights. The relative importance of those matter, but individually those dimensions are easy to misinterpret if you don't have a more systemic picture (E1).

This finding is not inconsistent with food security literature. As was discussed in chapter two, it is commonly acknowledged by the scholarly food security community that a suite of indicators is necessary to tackle food security measurement due to its complexity (Coates, 2013; Gibson, 2012; Hendriks, 2015).

The majority of interviewees stressed that specific selection of indicators was secondary to an initial examination of a food security situation. Five interview participants expressed that indicator selection must be adapted to the particular food security situation of the communities in question (E1, E2, E3, E5, E6). Little input into specific indicators for use in a food security assessment within RSEA was provided during the interviews. The interviewees were generally very clear that the specific selection of indicators would have to be established following an initial assessment of the food security for communities potentially impacted by industrial resource developments. It was not uncommon, for instance, for interviewees to make comments such as: "I don't know if I have any real insight in good indicators to use to assess, other than to ground those indicators in the experience of individual communities so that it is context specific" (E6). Another interviewee said the following:

> Indicators only come once you know the dimension of food security you want to evaluate [based on the nature of a population's food security] … First is to say: what dimension of

> food security am I interested in and then usually the choice of indicators comes down to what data are available and what kinds of resources you have (E5).

Literature investigating food security assessment and indicator selection show that a specific combination of indicators for food security assessment depends on purpose and context (D. Maxwell et al., 2014). Therefore, interview results were consistent with the literature, as both advise that indicator selection cannot be finalized until a specific context is established.

Additionally, two interviewees noted that indicators are far from perfect in general as well as for the distinct purpose of evaluating food security elements (E1, E6). Indicator limitations are commonly recognized in food security literature. For instance, Jones et al. (2013) suggest that measuring food security is limited by the tools and indicators available today. This understanding may be part of the reason why the interviewees were so reluctant to provide a list of potential indicators (with the exception of some indicators of human health) emphasizing, instead, that indicator selection follows an assessment of the food security pathways.

Nonetheless, a finding from the interviews was that part of the assessment of food security in RSEA would involve investigation into what the best and most effective indicators are for food security components identified as important to a particular region's food system. With the tremendous amount of effort currently going into indicator research for food security, the selection of indicators for use in a particular RSEA food security assessment should depend on what the best indicators are for the various food security concerns at the time of the assessment. In congruence, Jones (2013) notes that food security indicators and measurement tools will continue to improve and evolve, further underscoring the suggestion that indicator selection should be completed alongside a review of the literature, and/or, in consultation with food security experts.

4.1.4 Meaningful public engagement

Perhaps the strongest theme to emerge from the interviews was the importance of meaningful public participation. All seven interview participants emphasized its criticality. Interviewees were quick to point out that understanding the experiences of those within a location under assessment is key for understanding a food security situation and potential intervention. In other words, those who experience it need to be involved. This finding is consistent with food security literature. Anderson & Cook (1999), for example, include public

participation as a key element to adequately addressing food security. Likewise, Thomson (2001) asserts there is a need for increased public participation when approaching food security in a policy arena. However, the advocacy for public engagement within the interview data was noteworthy; suggestive that while scholars have been arguing for its integration in decision-making processes for a long time, in practice the recommendation seems to have been largely ignored. It was clear from the interview results that public engagement should be an utmost priority within a food security considerate RSEA.

This pronounced assertion regarding the importance of public participation by the interviewees is perhaps due to a familiarity with public governance research. It is well established within scholarly literature that public participation enhances democratic governance efforts, especially in social policy (Newman, Barnes, Sullivan, & Knops, 2004). Public participation is often linked to democratic values of legitimacy, justice and effectiveness (Fung, 2006; McLaverty, 2017). Within the same set of literature, but more specific, a large body of SEA literature suggests public participation is a crucial component for effective SEA (for example, see Aschemann, Baldizzone, & Rega, 2016; Finnveden et al., 2003; Gauthier et al., 2011; Tetlow & Hanusch, 2012). For instance, Gauthier et al. (2011) recognize that effective utilization of public participation in SEA improves the credibility of SEA, subsequent program delivery, population representation, and transparency in decision-making. The high importance of public participation in SEA is, additionally, evidenced by its integration in international SEA legislation (Aschemann et al., 2016), and within IAIA performance criteria (IAIA, 2002). It is clearly established within the literature that public participation is a necessary component of democratic governance processes, including that of SEA.

The importance of public participation in RSEA is clearly not a novel idea. While influential public engagement was clearly a main concern to food security assessment in RSEA for effective governance, major aspects of the interview conversations dealt with additional and more direct recommendations surrounding public participation for a food security inclusive RSEA that included: direct outcomes, stages of importance, and effective participatory formats and approaches. Therefore, each aspect is further presented below.

Direct outcomes of public consultation. Within the interviews, the importance of meaningful community engagement was often emphasized in accordance with the context specific nature of food security. Interview participants stressed that contextual components of

food security need to be identified by a population and grounded in their experiences. One interviewee expressly stated: "If you want to understand it [food security] in the context of the people who are there. You've got to go to them first" (E2). Another interview participant correspondingly stated: "What issues and components are key to food security? Well, ask people and then come up with a list" (E4). It was clear that a major expectation of public participation exercises for food security assessment in RSEA is in the identification of food security components.

During the interviews, a great deal of the discussion was related to specific factors that should be identified or addressed in participatory exercises. Context specific factors that were outlined in Table 4.1, above, were all generally referenced in congruence with public participation. One interview participant, for instance, highlighted a number of key topics to be addressed during public engagement in a single breath, as follows:

> Go to the community, find out how people are obtaining food, find out something about ecosystems, find out something about the people themselves and how they address problems and formal capacity response to the problems (E6).

Most prominent amongst specific topics discussed, to address with public participation, were related to the following: understanding food system components; gauging and prioritizing threats and risk; understanding perception of risk and impacts; understanding culture and social values; understanding the historical food security situation; understanding the socio-political environment and its historical character; gauging social issues; and understanding temporal and seasonal issues.

To highlight the importance of community participation for understanding the context and gauging risk, five of the interviewees directly emphasized a more general importance of engaging with the public essentially stating that an expert-exclusive perspective is inadequate (E1, E2, E3, E6, E7). Likewise, all seven interviewees implied that there was a significant risk in getting the wrong assessment of food security without consulting the public. It was not uncommon for participants to make comments such as: "I think sometimes experts look at a particular region and think 'this is how food moves around the streets and how people get access to what they need', but it can sometimes go beyond that" (E1). Another interviewee, likewise, suggested that consultation with the public allows for a balance between scientific knowledge and the knowledge that exists within a local community, as followed:

> I think it [food security assessment] should always start with understanding food security from the perspective of the people who are in that situation. I think many times experts hover above and say, 'this is what's important', but you have to question further about local knowledge. The people who understand the landscape best are the ones who live in it, who actually extract things from it. I think the key to this is really is in the perspective… Knowledge that communities have gathered over time, that knowledge has allowed them to sustain themselves in this one particular place for generations. Just because you don't have scientific tools that can measure those things, it doesn't mean that it's not valuable (E2).

This idea is inherently linked to the general importance of public participation in governance for advancing democratic values, discussed above. Nonetheless, its inclusion as a prominent discussion point in the interviews might be indicative that there are ongoing challenges in this respect.

Along the same vein, one interview participant asserted that an expert-exclusive perspective could exacerbate food insecurity, by overlooking and reinforcing social prejudices that may pre-exist in the decision-making arena. The following excerpt illustrates this perspective:

> Food security can be further driven by a lack of decision-making power… We have to consider that there are strong power dynamics at play in all of these situations because people who are food insecure tend to be more marginalized because of economic status, or cultural background. So, there're assumptions that they don't know, or can't make decisions for themselves, or something, so somebody else needs to come in and tell them what should be done as opposed to working collaboratively (E7).

Although not as directly emphasized, four additional interviewees also implied that public participation was an avenue to which vulnerable and marginalized voices could be amplified. This idea that marginalized, less powerful and more vulnerable voices are more likely heard with the integration of public participation processes is, again, clearly reflected in the literature surrounding the importance of public participation in governance. Within the literature it is upheld that enhanced public participation gives marginalised groups a greater opportunity to have their needs met, as their voices are amplified (Gauthier et al., 2011; Newman et al., 2004).

Stages for public consultation in RSEA. Interviewees were asked questions related to RSEA stages; consequently, interview data uncovered insight into the stages to which public participation was believed to be particularly important for the incorporation of food security in the process. A strong trend emerged from the interview data indicating that public participation should be incorporated in multiple stages of the RSEA process. Table 4.2 shows the number of

responses supporting the utilization of public participation in the various RSEA stages. Three of the interviewees suggested that public participation should be utilized throughout the entire RSEA process – in profiling the community, identifying indicators and stressors, helping determine alternatives, assessing the impacts, identifying preferred alternatives and management strategies, monitoring and evaluation (E1, E5, E7). Others, however, implied that certain stages of RSEA were particularly important for the utilization of public participation. Based on emphasis observed in the interviews, the most important stages for public consultation were in the two earliest stages (scoping and in identifying regional stressors and trends), in late stages of evaluation, and when assessing impacts and cumulative effects for each alternative (a mid-stage). The stage that received the least support for public participation, albeit still a significant amount, was in one of the later stages in which a monitoring program is developed.

Table 4.2 Number of interview responses emphasizing the need for public consultation within particular RSEA stages

Stages of RSEA	**No. of responses**
1. Scoping	7
2. Identify regional stressors and trends	7
3. Identify strategic alternatives	4
4. Assess impacts and cumulative effects for each alternative	6
5. Identify preferred strategic alternatives	5
6. Identify mitigation and management strategies	5
7. Develop monitoring program	3
8. Implementation and evaluation	7

Early stages of the RSEA process generally involve a scoping exercise in which valued ecosystem components are identified, followed by an overview of the environment to identify regional stressors and trends (CCME, 2009). It was expressed in the interviews that these early stages are critical for food security assessment in order to understand the general components of the food security situation, identify details of the regional food system, and gauge the level to which the region plays a role in the population's food security overall. There was an abundance of interview data similar to the following excerpts: "The first response has to be that you have to let the community identify for themselves how they obtain food security" (E6); and "If you want to establish what the valued components are, you need to find out who is valuing them" (E4).

Interviewees also identified early stages of RSEA as critical to determine the general importance and relevance of the region to a population's food security. The majority of interview participants felt that for a regional impact assessment of food security to be relevant, there needed to be some regional components to the food system (E1, E2, E5, E6). This view implies that consultation with the community and some groundwork by the practitioner was informative in those early stages of the RSEA to determine the relevance of regional food security since a full food security assessment may not be necessary for a RSEA process. The sentiment that the regional food system should play a role in the population's food security for it to be included in the RSEA, was expressed by several interviewees, and is discussed in more detail in section 4.2.1. The importance of public participation in early stages for identifying the regional relevance of a population's food security, however, is noteworthy and pertinent to the current discussion of the role of public participation in food security assessment for RSEA.

With regard to stages that include the assessment of impacts and cumulative effects, the majority of interviewees suggested that impacts would need to be understood from the perspective of those experiencing them, and therefore in consultation with the public. For example, one interviewee suggested:

> If you really want to get at people's perceptions of how change in policy or plan will make them vulnerable, then you need to engage with them… Say 'if this change to this resource was made' and then walk people through this scenario, you would have an understanding of how it would likely affect different food security status. And you try to minimize damage to your key outcomes of interest (E5).

This perspective was shared by six of the seven interviewees (E1, E2, E4, E5, E6, E7).

The final stage of monitoring and evaluating impacts was an area in which all interviewees felt that the community needed to be involved. Similar to that of involving the public in the impact assessment, the interview participants were generally quick to suggest that those experiencing the impacts would be best suited to informing how impacts may be felt over time.

Although certain stages were identified as more important than others in the utilization of public participation, interview results supported its utilization throughout the entire RSEA process. Three participants were particularly insistent (E1, E5, E7). For instance, one interviewee suggested that consultation "should be as iterative as possible: at every step. … this very clearly iterative process that starts with background and context and ends up with participatory

indicators" (E1). Others were less explicit, nonetheless, the inclusion of the public in various RSEA stages was clearly maintained in the interviews. This particular perspective is shared by select SEA scholars. Gauthier et al. (2011), for instance, assert that public participation should be included in multiple stages of SEA, in line with interactive and upstream planning streams.

Participatory format. Specific public participation formats were discussed in the interviews albeit not in tremendous detail. A majority of the interview participants indicated that obtaining narratives and stories was an advantageous means of collecting food security data, and particularly for establishing characteristics of a population's food system (E1, E2, E5, E6, E7). The following quote showcases this view:

> I don't know if I have any real insight in good indicators in the experience of individual communities. That is context-specific, and the most useful way I've come at this is to use the pathways approach where you ask people: 'what are your pathways for food security?'. Generate narratives and stories around those pathways (E6).

A few of the interviewees also expressed that obtaining narratives was in useful in final evaluation stages of the RSEA process, or, alternatively, in the assessment of cumulative effects (E2, E4, E6, E7). For example, one participant mentioned: "after a mine goes in, they eat less bush meat. Well, why? What does that mean? You'd need to ask them" (E6). The implication here is that an overview of how a population's food security situation may or may not have changed is best obtained by way of stories or narratives.

Stories and narratives necessitate highly involved and intense forms of public participation mechanisms, in which high opportunities for input are provided by way of face-to-face interactions that permit informal conversation (National Research, 2008). However, highly intense public participatory formats are generally less inclusive of the whole population, opting to engage with more select subsects of the population, identified following more open public participation formats and/or through administrative research (National Research, 2008). Therefore, participant selection is an important component of intense public participation formats, to ensure representation is obtained from the appropriate target population. The interview participants were very clear about the importance of identifying the target population of food security assessments and the need to focus on vulnerable populations (see more details in section 4.1.5).

Traditional knowledge (TK) is also a means of collecting data rich narratives and stories. Traditional knowledge is not generally considered a form of public participation (CEAA, 2008),

and many scholars align TK more with scientific or technical knowledge (Endres, 2009; F. Fischer, 2000). However, the interviewees often discussed TK in correspondence with public participation, as it is a means of obtaining local knowledge by way of meaningful engagement. Traditional knowledge was discussed in all interviews as a potentially important form of data collection for food security assessment in RSEA, both as a result of public engagement as well as a more general data source. Five of the interviewees, however, emphasized that it may not always be necessary, and that TK was important in certain contexts, such as when verbal history is important to culture (E1, E3, E4, E5, E6). For instance, one interview participant mentioned:

> You have to ask to what degree is traditional ecological knowledge used by the local population in attaining that food security and how do they do it. So, is that migration patterns of caribou? Is it knowledge of when the fish swim up the river? (E4)

Six of the seven interviewees implied that TK would be particularly useful in identifying regional stressors, assessing impacts and understanding potential cumulative impacts (E1, E2, E3, E4, E5, E7). In this regard, one interviewee explained:

> It is paramount to consider those [TK] perspectives because not only do they know how things work, but there's also a history of knowledge with that, in knowing how things have changed in more recent years. And that knowledge is vitally important in terms of understanding the landscape, because I think with assessments you get a static picture of what is taking place now, but having a much longer-range perspective with the ebbs and flow of what is going on gives you a much better, holistic, understanding of this ecosystem, and how it adjusts, versus this sort of static view of a one-time assessment kind of thing (E2).

There was a clear respect for TK amongst interview participants, and a belief that meaningful data could be obtained through TK collection in a food security inclusive RSEA.

4.1.5 Focus on vulnerable populations

Identification of who should be the focus of a food security assessment within RSEA was another subject that emerged within the interviews. All interviewees expressed that the populations most vulnerable to impacts should, necessarily, be the main focus: in terms of the population under assessment and of those involved in public participation processes. Generally, when discussing vulnerability, the interviewees referred to populations that rely heavily on the regional food system for their food security, as well as those that are simply more vulnerable to food insecurity. Food security literature suggests that people vulnerable to food insecurity are

those that fall into a low income adequacy bracket, reliant on welfare, single mothers, lack home ownership, or of Indigenous status (Kirkpatrick & Tarasuk, 2008).

Common within the interviews were statements such as the following: "The people who should participate are the people who are going to be affected by this type of construction or development that's coming in. That's where is should always start. Who is going to be affected?" (E2). The term "target population" also arose in a couple interviews, referring to those more likely to be impacted (E1, E4). More specific to the region, five interview participants directly referenced those that are most reliant on the region for their food security—the people to which the regional food system is important to their food security—as the target of the food security assessment (E1, E2, E4, E5, E7). Two interviewees clarified that those at risk of encountering impacts to their food security from regional development may not be the most vulnerable to food insecurity, overall, but may be most vulnerable due to their reliance on the region for food security (E4, E5).

Four interviewees also directed some discussion towards those that are potentially marginalized or discriminated against within the population (E1, E5, E6, E7). A few participants noted the marginalized populations are those more likely to experience both food insecurity and negative impacts from environmental manipulation (E1, E5, E7). For instance, one interviewee stressed that "people who are food insecure tend to be more marginalized because of economic status, or cultural background" (E7). In line with concerns over potential social prejudices, the four interviewees mentioned that the inclusion of and focus on marginalized communities would help improve effectiveness of a food security assessment. Engaging with more vulnerable populations may help avoid issues with social prejudice – making an effort to engage with those who may be in a lower standing in the socio-political realm. Literature supporting the need to integrate marginalized or vulnerable populations in EA processes is extensive, as it was outlined earlier in the chapter.

A few interviewees raised another concern in regard to vulnerable populations, related to the broad, regional scope common to RSEA. Three of the interviewees discussed a problem of averages as a potential challenge associated with the regional scale (E3, E4, E5). One interviewee articulated that expanding the scope of food security assessment to a regional scale may result in data that is too expansive, illustrated in the following: "The more aggregated the scale analysis, the cruder the indicators will be, so you will end up talking about averages" (E3).

Two of the interview participants mentioned that averages are likely not representative of those more vulnerable (E4, E5), and that the data would be unreliable, failing to focus on those who would feel the impact. For example:

> It's very easy to talk about food security at a region scale in terms of availability, but then access at a region—are you going to have an average? An average per access when across that region? Households are going to be so different… utilization is really only an issue for more vulnerable groups, you could say poor, you could say women and children, you could say it does not make sense to talk about malnutrition indicators for more affluent groups (E5).

A solution provided to this problem of averages was that the target population of the assessment be narrowed toward the more vulnerable population. A narrower focus generally permits more intensive research to be conducted with greater levels of interaction, such as one-on-one interactions, affiliated with obtaining narratives and stories, and reducing domination or marginalization (Bryson, Quick, Slotterback, & Crosby, 2013). The identification and focus on the populations that are the most vulnerable to impacts from development and who may not otherwise have their voices heard in governance decisions was firmly recommended within the interview data and supported in the literature.

4.2 Integration of food security assessment in RSEA

To date, no research has been done to establish how to integrate food security assessment within a RSEA framework. However, interview results delivered clear direction in this regard. The dominant theme to emerge was that an overarching system approach was needed to achieve such integration. This section first provides an overview of the suggested approach to a region-specific scope, followed by an explanation of a 'system', or 'pathway' analytical approach recommended for integrating food security assessment within RSEA.

4.2.1 How to perform food security assessment at a regional scale

When asked about the application of a food security assessment to a regional scale typical to RSEA, interviewees were quick to link discussions to context. It was noted in many of the interviews that the nature of a food system will depend on the population in question, and that a population's food security is likely to be only partly reliant on their region. One interviewee noted: "Nearly all community food systems are situated in a global food system, they're only partially coupled to the local region" (E1). Consequently, with the focus of RSEA being on

regional impacts, only those components to which food security depends on the region would be the focus of an assessment. Thus, it was commonly expressed in the interviews that an initial assessment of the region's role in food security was needed to determine how important or expansive a food security assessment would be in a RSEA process. One interviewee was insistent in this regard, asserting the following:

> First of all, you need to figure out where their food comes from. Assuming you do that, and that would have to be collected, assuming you do that and there was a strong regional component to the food system that they rely on, and not just all being brought in from all over the world, then I could see it [being relevant to include food security in the RSEA] (E6).

Five interviewees suggested that after an initial assessment, and assuming the region plays a role in a population's food security, a regional impact assessment should focus narrowly on the region-specific components of the population's food security (E1, E3, E4, E5, E6). One interviewee with such a suggestion is expressed the following:

> You may not, in that case, need to talk to the people, per se, about what's on their plate, and instead look at where they're hunting and say are there any animals there, are there any fish there? You can infer, if you know how much is available, if you know how much is harvested, you know what the needs are, you have other ways of getting at the information by looking at the fish and game. Or the water; you could look at the impacts on water and whether water is available for agriculture in the quantities necessary (E1).

Consequently, a full analysis of all food security components would not be the aim of a food security assessment in RSEA. The broad food security situation may be roughly assessed in early stages, but a full analysis of every aspect of the system would be beyond the scope of a regional impact assessment.

Some potential challenges surrounding regional scale assessment were raised during the interviews. Three interviewees initially believed it was simply a larger job than typical smaller-scale assessments, and would require either more information and money, or cruder data (E3, E4, E5). For example, in response to how a food security assessment would differ at a regional scale, one participant stated:

> Except for the cost involved and the logistics and so on I do not see any difference. You have to take into account location or situation specific issues, you have to look at cohorts we talked about, you have to look at the context specificity in any case whether it is regional or national, but of course it is a much bigger job. The bigger the region, the bigger the job (E3).

As the interviews progressed, however, all the interviewees, including those that suggested it was simply a bigger job, shifted their focus from general household food security toward behaviours, livelihoods, and characteristics of the regional food system, suggesting that regional components should be identified and analyzed early in the RSEA process. In this regard, five of seven interviewees implied that shifting the initial focus from typical household surveys, which is common to contemporary food security assessment (Barrett, 2010; A. D. Jones et al., 2013), to that of livelihoods or community behaviour (E2, E3, E4, E5, E6). One interviewee suggested the following application of a food security assessment at a region-specific scale common to RSEA:

> Have an understanding how typical households in a livelihood zone achieve or don't achieve food security and then be able to extrapolate that out to that geographic domain. Then if you could overlay those food economy groups or those household profiles with ecological zones then you could probably do what you want to do with your definition of region (E5).

In other words, identifying various livelihood strategies and behaviours of those that rely on the region can contribute to an initial characterization of the population and can help discern regional food system components. This insight provides direction for what an initial assessment of the region's role in food security would look like. From there, details surrounding region-specific components of food security can be further assessed in subsequent stages.

4.2.2 Applying system analysis for food security assessment in RSEA

For the purpose of conducting an assessment of food security in a regional context for an impact assessment, one suggested analytical approach emerged from the interviews. A "system", or "pathways", analysis was either directly or implicitly recommended by all interviewees. A system analysis examines a system, its pathways and its interactions (Arnold & Wade, 2015). According to the Merriam-Webster dictionary, a system is "a regularly interacting or interdependent group of items forming a unified whole" (n.d.). A food security system would, therefore, include any element or component that contributes to or plays a role in a particular food security situation. Interviewees recommended an investigation of all the pathways within the regional food system that leads to food security and an analysis of any interactions in the environment from potential incoming industrial development. One interviewee explained:

> Whether it's for impact assessment or intervention strategy development, you need to clearly identify pathways from drivers of food security to food security. How does a household or an individual get from the resource available, or the situation in which a person operates, and food security? If you don't have those pathways you really can't do

> a good job of evaluating impact of policies or plans. You need to understand the pathway from that policy choice. You need to understand where in the pathway a policy can be implemented that gets to your strategic questions (E3).

When discussing analysis, three of the seven interview participants directly mentioned "pathways" (E3, E5, E6); all seven interviewees discussed food systems; and all emphasized that food security components are not mutually exclusive—one component affects another. Four of the interviewees underscored the importance of understanding connections (E1, E2, E5, E7), which is a principal objective when examining pathways or systems (Arnold & Wade, 2015).

One of the main arguments for integrating a system analysis of food security into RSEA, emerging from the interviews, was that food security is a complex problem, with interlinking parts. In this regard, one interviewee stressed: "The most important part here is understanding the interconnectivity … look at the interrelationships" (E7). Also implied in the interviews was that there is no way to look at the situation or the impacts of a complex phenomenon without breaking it down into component parts and gaining an understanding of how those component parts connect to one another. This perspective is illustrated in the following quote: "We look at food security as one thing, but it is affected by many other aspects … it's not just one thing in isolation, but it works in different dynamics depending on what is in the local context" (E2).

System analysis not only permits a clearer understanding of a current food situation and an idea of what contributes to overall community food security, but also assists in the identification of indicators for food security, based on what those pathways look like. One interviewee, for instance, claimed that "if you can look at the pathway and identify each step in the pathway, you can use that step as an indicator" (E3). All seven interviewees indicated that gaining an understanding of the various components and pathways of food security not only aids in understanding the food security situation in the first place, but also provides the framework for what should be examined throughout the RSEA process—from initial scoping and identifying regional stressors, to assessing impacts, and finally to monitoring.

System analysis is a topic that has garnered tremendous scholarly attention over the past several decades (for example, Aronson, 1996; Douthwaite et al., 2007; Weller & Barnes, 2014). Within the literature, it is specified that a system analysis typically involves the examination of a relationship between a variable and an outcome, recognizing also, connected or contributing variables and factors (Arnold & Wade, 2015; Weller & Barnes, 2014). The interviewees were clearly familiar with research on system and pathways analyses. System analysis is generally

recognized for its suitability to assess complex problems with a broad range of components, such that interactions and feedbacks can be understood and considered when looking at the relationship between two concerns (Aronson, 1996).

Six of the seven interviewees suggested that employing a system or pathways analysis is critical for identifying which aspects of food security, or the regional food system, are most at risk and most likely to encounter impacts and threats from potential development (E1, E2, E3, E4, E5, E6). For example, one interviewee expressed the following: "The key question is pathways. We need to understand the causal link between what these interventions do and what the impact is on our indicator" (E3). Another interview participant more thoroughly detailed how the assessment of impacts might play out, as follows:

> You need a theory of change, impact pathway, causal diagram, whatever you want to call it. You need to say why would that proposed plan, or development intervention, have any kind of impact on any of those components of food security. What's the pathway, is it going to affect production, is it going to affect the ability to gather your own food, is it going to make prices of a key input, like oil, up or down, or whatever… You need to understand, does that natural resource development, in any way, threaten any of the activities or any of the assets that contribute to people being food secure… you need to understand how people in that region obtain food security (E5).

Application of pathways analysis in RSEA. The application of a system or pathways analysis was a main topic discussed in the interviews. It was stressed in the interviews that a system analysis should be carried out as the primary analytical approach for the overall food security assessment. An analysis of food security pathways would therefore commence in the very early stages of an RSEA process and continue all the way through to monitoring and evaluation. In those early stages, as it was previously mentioned, a quick assessment of the region's role would help define the regional role of the food system; this would be the chief result of an early application of system analysis. Behaviours, livelihoods, and general characteristics of the regional food system would be a main focus of the initial system analysis, looking for connections to food security.

The interviewees consistently tied the implementation of a system analysis to the definition of food security. To ensure that no aspect or component of food security is overlooked, it was common for food security experts to recommend regularly referencing the food security definition, and its dimensions, in order to gather a comprehensive and systemic picture of the

food security pathway. Three interviewees directly addressed this (E4, E5, E7), and the remaining four did so implicitly. One interviewee noted:

> The point of the definition of food security is to say that all four components are equally important and will be differentially threatened depending (a) on how people obtain food security and (b) on the link between resource under development and food security status (E5).

The same food security expert claimed that failing to reference the full conceptual definition of food security may have detrimental consequence: "a danger there is that you may miss something that isn't currently a problem but may become a problem. I am a big proponent of going component by component and tick boxes". Even more assertively, another interviewee alleged: "this whole analysis is hinged on the definition of food security and our understanding of what it means" (E4). It is clear that food security experts believe that the conceptual definition of food security must be embedded within the system analysis to ensure key components, and the four dimensions, are not overlooked. In other words, interview data suggests that the food security definition and its dimensions would provide the blueprint for collecting pertinent data related to the regional food system; and with food security as a beacon, pathways can then be established and analyzed.

Comparison with a pre-existing framework. An 'integrated food systems' approach, developed by Ericksen (2008), was introduced in chapter two as a potentially useful food security assessment approach for RSEA. The integrated food systems approach seemed well suited to an assessment conducted in preparation for natural resources development, specifically when assessing potential threats to food security. A goal of this phase of research is, partly, to determine if and how this approach may be utilized for food security assessment in RSEA.

Ericksen's approach utilizes system analysis, in which interactions between a food system and environmental change are examined. A broad definition of a 'food system' is at the core of the framework, inherently linking the concept of food security to a system and encompassing many aspects of the larger food security definition. This approach, with its focus on 'systems' and 'interactions' and integration of an holistic understanding of food security, therefore, seems somewhat applicable to the analytical approach recommendations for food security assessment in RSEA, as specified by the expert interview participants. Additionally, Erickson's approach was consistent with the experts in many of the details identified as essential for adequate consideration of food security (summarized in Table 4.1) with the exception that

Ericksen lacks an emphasis on the socio-political environment and social and cultural histories, which were emphasized as critical considerations in the interviews.

Ericksen's integrated food systems approach provides direction on what a broad food system pathways and interactions consist of, and therefore may be useful when establishing pathways and interactions between a regional food system and potential development in RSEA processes. However, the approach is deficient in a few key areas that emerged as important in the interviews. First, public participation is not included within Ericksen's framework. The utilization of public participation was the strongest theme to emerge from the interviews and should, therefore, take a principal role in any framework intended to inform food security integration in RSEA. Second, Ericksen's approach is intended to apply to various scales and levels. However, the regional scale that is common in RSEA does not appear to be well addressed within the integrated food systems approach. Examples of food systems included in the approach manuscript are related more to local, global or district scales (micro-scale or, alternatively, scales that conform to administrative boundaries). Relatedly, Ericksen specifically notes that there is a "need to treat food systems as multi-scale and level, even if the outcomes of interest are focused at one scale in particular" (p. 243). This assertion contradicts a main finding that arose from the interviews, which conveys that the regional components of a food system should be the focus of a food security assessment in RSEA, including an early assessment to identify those regional components. An approach for food security assessment in RSEA was therefore deemed as requiring a narrower and pointed focus by the participants interviewed in this study than that of the integrated food systems approach.

Finally, the integrated food systems approach is intentionally broad to apply to a variety of applications. For effective application to a specific natural resource governance process, additional guidance and clarity may be necessary, particularly for a process that has proven to be unfamiliar with food security research and theory like that of RSEA. Ericksen explicitly acknowledges the potential for obstacles in the application of the approach, as follows:

> much of the ecological systems literature seeks to identify critical parameters, while food security literature looks for root causes, and food policy literature wants to identify key issues for policy resolution. I have tried to find a common ground but recognise there are still some incompatibilities which may complicate analysis (2008, pp. 243-244).

The integrated food systems approach provides potentially valuable insight into the impact assessment stage of RSEA but is less applicable to guiding the consideration of food security in

the process, overall. A framework for considering food security effectively in RSEA would benefit with the inclusion of a typical RSEA framework, to clarify when and how food security considerations and procedural components would be best integrated.

The applicability of the integrated food systems approach to the outcome of this research (a conceptual framework for effectively integrating food security in RSEA) is therefore limited, yet potentially informative in food security pathway development and in impact assessment stages. Any use of Ericksen's approach in the development of the final conceptual framework, or in the framework itself, is referenced when the research framework is presented in the following chapter.

4.3 Key consideration criteria for an effective food security inclusive RSEA

Among the number of recommendations for effective food security assessment in RSEA that emerged from the interview data, a myriad of essential topics to consider for effective food security assessment in RSEA were identified. Subsequently, criteria for food security assessment were amalgamated with the topics, interview data, and literature to help establish key consideration criteria more conducive to application in RSEA processes. The resulting consideration criteria, as presented in Table 4.3, were used to inform the SEA document analysis in the following research phase.

Key interview findings addressed within the consideration criteria include: regularly reference the definition of food security and it's four dimensions, ensure holistic and systemic analysis, break down the definition into component parts for ease of analysis, ensure context is always considered, characterize the "target" or "vulnerable" populations, and characterize the region's role in food security. Additionally, the consideration criteria, integrate a breakdown of the food security definition into eight elements (established from food security literature and interview results, and partly informed by Ericksen's (2008) integrated food systems approach), integrating various context specific consideration topics within. The eight food security elements include: (1) availability; (2.1) physical access; (2.2) financial access; (2.3) social access; (3.1) food quality nutritional utilization; (3.2) economic utilization; (3.3) cultural utilization; and (4) stability. The consideration criteria further incorporate consideration details significant to initial characterizations of vulnerability and of the regional food system. Finally, the key criteria utilize the four overarching dimensions of food security are already well established in food security

literature, and include: (1) availability, (2) access, (3) utilization and (4) stability. Access and utilization dimensions have been further classified into sub-categories, based on distinguishing elements.

In conclusion, the resulting consideration criteria in Table 4.3 are based on: (i) a broad, holistic understanding of food security, as per definition (ii) the eight food security elements; and (iii) consideration criteria for each food security element, interpreted from the context-specific consideration details that emerged from the interviews and put into perspective of related regional issues, that were also brought up within the interviews. The criteria are not necessarily exhaustive; however, they provide a thorough list of considerations, and cover the basis of what was identified as important to food security assessment in RSEA by the interviewees, adjusted to align directly to a regional setting.

As previously established, certain considerations were particularly important in the early stages of RSEA for effective food security assessment. Characterizations of behaviours, livelihoods and food system activities to determine the region's role in food security was identified as critical in early RSEA stages (discussed in detail in section 4.2.1). Additionally, it was clear from the interview results that gauging vulnerability was a necessary outcome of early-stage assessments, to define the target population, and those to be involved more extensively in the public participation exercises. To gauge vulnerability, characterizations of the communities, the regional food system, the socio-economic environment and the socio-political environment were emphasized as essential data. Those consideration criteria are pertinent to initial environmental characterizations and are discernable in Table 4.3 with asterisk and a grey shade.

The consideration criteria provide a guide for approaching food security in RSEA, ensuring that it is given comprehensive consideration in decision-making processes and aligning with a recommendation made by a couple interview participants to essentially "go component by component, tick boxes" (E5). In addition to its potentially valued use in the application of RSEA, the consideration criteria established in this section was intended to inform and direct the SEA document analysis in the following phase of research, to identify the level and manner of consideration for food security in Canadian SEA practice.

Table 4.3 Consideration criteria for food security in RSEA[9]

Food security dimension	Food security element	Regional consideration criteria
Availability	Food Abundance/ Supply	Profile of regional food species (flora and fauna) consumed by the community - profile of regional food consumption*
		Food produced within the region*
		Agroecosystem productivity
		Abundance (and distribution) of food species within the region
		Factors that contribute to the existence/abundance/wellbeing/health of food species
		Clean water supply within the regional ecosystem
		Details of seasonal and temporal availability of food species
Access	Physical Access	Geographical areas of importance for food acquisition/harvest*
		Seasonal and temporal issues related to accessing regional food
		Maintenance of abundance and distribution of food species, such that food acquisition/harvest is somewhat predictable/plan-able
		Access to clean water and sanitation practices
	Economic/ Financial Access	community economic profile (attention paid to household details)/ poverty profile (vulnerability to changes in income or costs)*
		Input costs associated with food acquisition/harvest (i.e., gear, fuel, time, effort, etc.)
	Social/ Cultural Access	culturally and socially important food acquisition/harvest methods*
		culturally and socially important food species*
		culturally and socially important geographic areas for food acquisition/harvest*
		Social barriers or opportunities that influence access to regional food (poverty, prejudice, policies, case law, legislation, formal institutions that may bolster or hinder access, government supports, community cohesion, historical but lasting social conflict or social domination (i.e., colonization))*
		Details of the historical food system and social satisfaction regarding changes*
Utilization	Nutritional Utilization and Food Safety	Typical menu/diet of regional communities (and the role of regional food)*
		Food diversity typical of regional communities*
		Nutritional values of regional foods consumed
		Safety of regional food (contamination?)
		Perception of food quality/safety and impacts of consumption
		Health profile - health situation and outcomes (prevalence of malnutrition, somatic disease, other food-related disease, mental health)
	Economic Utilization	Characterization of the regional economy, and the role of the regional food economy*
		Economic outputs and livelihood outcomes of regional food economy*
	Cultural/ Social Utilization	Culturally and socially important food species (also within social access)*
		Cultural and social practices related to regional food (beyond acquisition/harvest)*
		Traditional diet and profile of food history (if pertinent to cultural histories)*
		Ceremonies or celebrations surrounding or critically involving regional food*
Stability	Stability	Strategies, institutions, or programs in place to conserve and nurture socially and culturally important practices surrounding acquisition and use of regional food*
		Vulnerability profile: economic, health, and social vulnerability (risk of impact to small fluctuations, or resiliency to shocks and stresses) - profile: demographics, social services data, government assistance data)*
		Conservation programs of culturally or socially important (geographical) areas used for regional food acquisition/harvest
		Conservation programs of culturally or socially important regional food species
		Conditions for the stability of food species important to regional food
		Details of institutional response to shocks (government and otherwise)
		Emergency supports

* consideration criteria that is particularly important to initial environmental characterizations and baseline studies

[9] The various considerations listed are possible focus areas and criteria for food security assessment in RSEA relevant to each of the four primary dimensions of food security: availability, access, utilization, and stability. Some examples may not be relevant in all cases, it is acknowledged that a comprehensive assessment could be cost and resource prohibitive. Essential baseline considerations are noted.

CHAPTER 5

PHASE II RESULTS AND DISCUSSION

The chapter analyzes how well SEA documents consider basic food security elements and dimensions. It also explores whether needed procedural and analytical elements identified as important when incorporating food security into RSEA are present in the SEA documents. The chapter concludes with the presentation of a suggested framework for effective consideration of food security in RSEA, developed according to findings of both phases of research.

5.1 Consideration for food security in SEA Documents

A word search was conducted in the earliest stages of the document analysis within 17 SEAs, largely to identify relevant food security-related sections for further analysis. Direct consideration for food security was found to be absent from all SEA documents: the word search conducted as "food security" produced zero results. Following a more detailed analysis, it was confirmed there was no direct discussion of food security within any of the 17 SEA reports analyzed. This finding is not tremendously surprising since literature integrating food security and SEA is lacking, as discussed in chapter two. Notwithstanding the lack of direct consideration for food security within the SEA documents, some indirect consideration for food security was found; various elements of food security were partly addressed in all 17 SEAs analyzed.

Using the definition and contemporary conceptual understanding of food security, as well as the consideration criteria for a food security inclusive RSEA developed in the previous chapter as a guide, relevant data from the SEA documents was organized into categories based on the four dimensions of food security: availability, access, utilization and stability, and then further into eight food security elements: availability; physical access; financial access; social access; quality and nutritional utilization of food; economic utilization; cultural utilization of food; and stability. For the purpose of this research, food security elements were separated and isolated – such that a reasonable system of categorization and analysis could be developed. In reality, the elements of food security converge. Economic utilization, for example, is largely concerned with livelihood, which predominantly refers to money-making activities and the ability to gain a living; however, livelihood also refers to quality of life and the ability to obtain

assets, both tangible and intangible (De Haan & Zoomers, 2005), and, therefore, affects financial access, social access, cultural utilization and stability – and, to some degree, extends across all dimensions of food security. Nonetheless, eight largely independent factors fit within the concept, in accordance with its evolution and the consideration criteria outlined in phase one.

A 5-point magnitude scale was utilized for the analysis of food security consideration in the 17 SEAs, as discussed in chapter 3, but classification was based on the eight elements previously introduced. Table 5.1 shows the results of the magnitude scale classification of the 17 SEAs for their consideration of the eight food security elements.

Table 5.1 Consideration for elements of food security in analyzed SEAs

Food Security Element / SEA #	Availability	Access			Utilization			Stability		
	Availability	Physical Access	Financial Access	Social Access	Food Quality and Nutritional Utilization	Economic Utilization	Cultural Utilization	Stability	Total Score	Total Score Percentage
1	2	1	1	0	1	1	0	1	7	22%
2	3	2	1	1	2	2	0	2	13	41%
3	2	1	1	0	1	2	0	2	9	28%
4	3	2	1	1	2	2	0	2	13	41%
5	3	3	2	3	2	2	2	2	19	59%
6	3	2	1	1	2	2	1	2	14	44%
7	2	1	1	1	1	1	0	2	9	28%
8	3	2	1	1	2	2	1	1	13	41%
9	3	2	1	1	2	2	1	1	13	41%
10	3	2	1	1	2	2	1	1	13	41%
11	3	2	1	1	2	2	1	1	13	41%
12	3	2	1	1	2	2	1	1	13	41%
13	3	2	1	1	2	2	1	1	13	41%
14	3	2	2	2	2	3	2	3	19	59%
15	3	2	2	1	2	3	1	3	17	53%
16	3	2	2	2	1	2	1	2	15	47%
17	3	2	1	1	2	2	1	1	13	41%
Total Score	48	32	21	19	30	34	14	28		
Total Score Percentage	71%	47%	31%	28%	44%	50%	21%	41%		

Level of Consideration:

0	Not at all considered
1	Rarely considered
2	Somewhat considered
3	Largely considered
4	Fully considered

None of the SEAs could be labelled as having fully considered any food security element since there was no direct consideration for food security in any of the SEAs. Therefore, no SEA obtained a scale point of 4 – fully considered. Several SEAs, however, obtained a scale point of 3 – largely considered, because many criteria for a specific food security element were considered, at least in part. (Appendix E presents spider graphs for each of the SEAs based on how they scored for each food security element. Appendix F presents spider graphs for each of the eight food security elements showing the level of consideration by each SEA. The data used for the spider graphs are all contained within Table 5.1 but they provide a different visual).

Aggregating the scale point scores of all eight food security elements provided an overall level of consideration for food security for each of the 17 SEAs analyzed. For ease of analysis and discussion, the total scores were converted into percentages, where the total score obtained by each SEA was divided by the highest possible score (32) to obtain a percentage of the total possible score (PTPS). Figure 5.1 shows the PTPS for the consideration of food security for all 17 SEAs. The PTPS for the 17 SEAs ranged from 22% to 59%, with an average of 42%, and mode and median of 41%. The level of consideration for food security, overall, suggests there is considerable room for improvement in the consideration for food security in Canadian SEA practice.

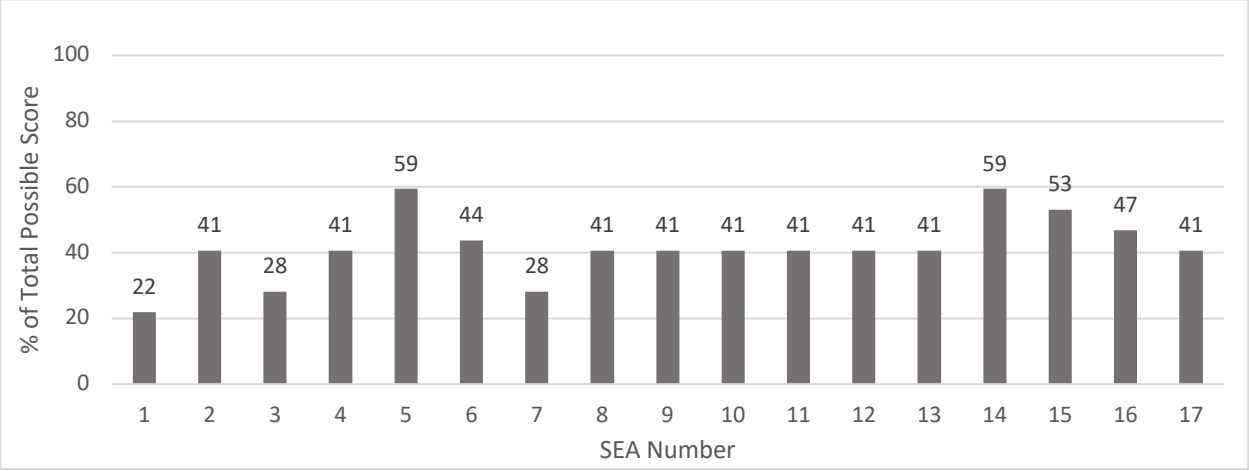

Figure 5.1 Percentage of total possible score for food security consideration in each SEA

Similarly, an analysis was conducted to examine which food security elements were considered to a greater extent than others. Scores obtained by all SEAs for each individual food security element were aggregated and also converted to a PTPS (see Figure 5.2).

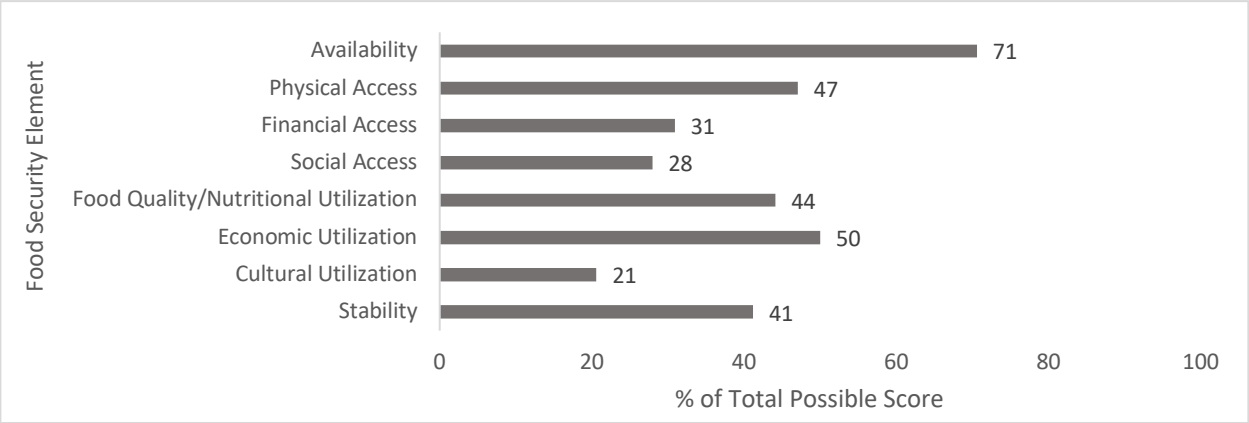

Figure 5.2 Percentage of total possible score for consideration of each food security element in 17 SEAs

Those elements of food security that obtained particularly poor scores (PTPS below 33% of possible score) included (i) cultural utilization, (ii) social access, and (iii) financial access, with PTPSs of 21%, 28% and 31% respectively. Cultural utilization and social access were the only two elements that contained classifications for the lowest scale point—there were SEAs that consisted of absolutely no consideration for these food security elements. Financial access, which performed third poorest, contained the highest frequency of the second lowest scale point: most of the SEAs minimally, or poorly, considered this aspect of food security. Based on these lowest scoring elements, it appears that socio-economic issues are poorly considered in Canadian SEA, specifically those related to culture.

The only food security element to obtain a high score from the analysis (over 66% of possible score) was availability, with a PTPS of 71%. The availability element was largely considered in 14 of the 17 SEAs, far greater than any other element. The remaining four food security elements – stability, food quality and nutritional utilization, physical access, and economic utilization – all obtained moderate total scores, with PTPSs of 41, 44, 47, and 50% respectively.

Overall, while food security is addressed to some degree within all 17 SEAs, some elements are considered more comprehensively than others. Only the four elements with high scores (availability) and poor scores (financial access, social access, and cultural utilization) are further detailed below.

5.1.1 Availability

Food security assessments of the availability dimension commonly involve a measurement of the balance between a population and food supply; attention is generally aimed at food stocks and production, as well as food trading—in an open economy (Burchi & De Muro, 2016). Regional strategic environmental assessment approaches are customarily focused on a closed region—the scale focus is within boundaries—whereas food economies in the modern world are typically open—global in scale (Norberg-Hodge, Merrifield, & Gorelick, 2002). Nevertheless, aspects of a region may play an important role in an overall food economy for some communities (Feenstra, 1997).

With regard to a region that is common to RSEA, those aspects of regional food system that contribute to a community's food security should be the focus of an integrated food security assessment, as was identified in phase one of this research. Accordingly, an assessment of the availability dimension in this context, thus, aligns more with those approaches used to assess food security of a closed system, in which food production and food stocks are the primary focus (Burchi & De Muro, 2016). The most relevant features of the availability dimension within an RSEA framework are, therefore, food productivity of the region, conditions for productivity, and the subsequent food supply of the regional food system. Building on the literature, and based on findings from the previous research phase, consideration criteria for a food security assessment pertaining to the availability dimension would include: a profile of regional food consumption; foodstuffs obtained within the region—outlining food species and their relative importance in the regional food system; and food production or abundance within the region, conditions for productivity, and productive capacity (Burchi & De Muro, 2016; Ericksen, 2008). When analyzing the SEAs for their consideration of the availability dimension, attention was, therefore, paid to regional food consumption or production within the region, food species and their importance, species abundance, and productive capacity of the region. More specific economic details related to productivity levels were chiefly analyzed within the food security element labelled 'economic utilization' for this study.

The biological setting provides the basis for a region's food supply and productive capacity, aspects that are paramount to availability. All 17 SEAs contained a discussion of the biological setting, where flora and fauna existing within the region were discussed. Some of the SEAs, however, were much more inclusive, comprehensive and detailed in their discussion of

regional species than others. The degree of consideration for regional species, was largely where the discrepancy amongst SEAs was found concerning availability and, thus, the predominant influence in the determination and variation of categorization for this analysis criteria. Many of the SEAs delved into great detail about specific species, including information such as: abundance and distribution, habitat characteristics, placement in the food web (including predators and prey), lifecycle processes and requirements, migration routes and patterns, etc. Details related to the success and flourishment of species that are involved in the regional food system are fundamental to gauging the region's productive capacity and, thus, food supply capability (M. L. Jones et al., 1996). The majority of SEAs were, therefore, labelled as having largely considered this element. Those SEAs that were categorized as having only somewhat considered the element of availability (SEAs 1, 3 and 7) obtained a lower categorization scale point than the others largely because the information about the biological setting and species was less comprehensive, including more summarized data of a taxonomic phylum or class as opposed to details about family, genus or species. The remaining SEAs were more extensive in their coverage of specific species and included more detail.

The degree to which the biological setting considered was significant enough to categorize 14 SEAs as having largely considered availability; still, some variation in consideration amongst those SEAs remained. Most of the 17 SEAs were focused on those biological components that directly related to selected VECs. The selected VECs seemed to play a major role in how extensive the discussion of the biological setting was for the majority of SEAs. It was specified within SEA 8, for instance, that species not related to one of the selected VECs were not included in the SEA, showcased in the following excerpt:

> Fish species which are not species of special status, don't support fishery resources or other fish species of special status, and are not present in such abundance for a special area to be designated for that species, are excluded from the SEA.

Some SEAs (SEA 2, 4, 5, 16 and 17) did look slightly beyond VECs when characterizing the biological setting. Two SEAs, however, stood out in how far beyond VECs they ventured, when characterizing the biological setting. SEAs 14 and 15 expressed an objective to conduct more comprehensive, multi-species assessments of the biological setting, recognizing connectivity within the system. SEA 14, for instance, offered the following justification:

> Marine species abundances and distributions have often been looked at independently and not as part of a complete ecosystem. The approach of identifying and considering

> some key species individually is still relevant but must be complemented by a more multi-species approach in science and fisheries management. All the taxa in the grouping presented here (invertebrate, fish species, species of concern) interact and overlap, and many play key trophic roles in the Gulf of St. Lawrence ecosystem. Therefore, although human activities may affect a marine species deemed insignificant from a commercial perspective, this species may in turn play a significant role in the food web or larger ecosystem, such as being a key prey item for another species that has greater socioeconomic and/or ecological significance.

Because of their more extensive and inclusive approach, acknowledging the inherent interaction of environmental components, SEAs 14 and 15 almost obtained a higher scale point classification for their level of consideration. However, because a profile of food consumption was not included, in addition to their lack of direct consideration for food security, which may require a variety of additional context specific considerations, they could not be labelled as having fully considered the dimension. Nevertheless, it is surmised that the level of consideration for the biological setting in these two SEAs provide a solid basis for understanding the productive capacity of the regions, and that many components pertinent to food security availability would have been included in the respective assessments.

Despite the degree that the SEAs delved beyond VECs, it was made clear during the document analysis that selected VECs were supremely important in guiding the assessments, highlighting issues of particular importance, and identifying impacts. Table 5.2 shows an overview of the VECs selected in the 17 SEAs (the VECs in the table are based on groupings of similar VECs from the SEAs—a list of actual selected VECs for the 17 SEAs, as they were worded in the SEAs, is included in appendix G). Many of the VECs selected for the SEAs are pertinent to food security in some manner: fisheries, flora and fauna within the region, and sensitive and special areas all have a potentially important role in food security; yet, are not entirely inclusive of food security consideration criteria.

Table 5.2 Valued ecosystem components in analyzed strategic environmental assessments

SEA / VEC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
fisheries		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	16
species of special status	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	16
sensitive and special areas	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	16
fish and invertebrates and their associated habitat	√	√	√	√	√	√								√	√			8
marine mammals and sea turtles	√	√	√	√	√	√								√	√			8
marine-associated birds	√	√	√	√	√	√								√	√			8
fish and invertebrates of commercial importance	√		√															2
air quality			√															1
other marine components, activities and users																√		1

Sixteen of the 17 SEAs included ‘fisheries’ directly as a VEC, the exception being SEA 1 which included a related, but less direct, VEC: ‘fish and invertebrates of commercial importance’. Because fisheries almost certainly play a big role in a regional food system of coastal communities, fisheries would be pertinent to the consideration of food security (Kent, 1997). Furthermore, fisheries potentially interact with all eight food security elements. Without assessing fisheries from the perspective of food security, however, important outcomes might be overlooked, such as: nutritional benefits and physical health; contribution to social wellbeing; economic contributions; poverty reduction; sustainable livelihoods; and more (Allison, 2011; Kent, 1997; Weeratunge et al., 2014). Nevertheless, the consideration for fisheries within the SEAs was notable, and was the most significant factor contributing to any consideration for food security elements within the SEAs.

Beyond fisheries, other biological components may also play an important role in the region’s food security. For example, birds, whales and other animal or plant species, outside of the fisheries foci, may also be important in a region’s food system. With their broad focus of the biological setting, it is likely that many of the SEAs, and particularly SEAs 14 and 15, examine species of importance to food security outside of fisheries, but without being a focus of a VEC, or examined explicitly as a food species, details pertinent to food security are likely to be missed in the assessment.

Any discussion of species in terms of human consumption was largely devoid in the SEAs, and a broader discussion of the role the region plays in the food system was not included in any of the 17 SEAs. With the exception of one SEA, a discussion of food consumption was

either absent or very briefly mentioned in the SEA reports. Many of the SEAs discuss commercial importance of regional fisheries, but the particular use, be it for food or otherwise, is not specified. While it may be assumed that fisheries play a major role in the regional food system of coastal communities, the lack of specificity in this regard is noteworthy. SEA 5 was the only SEA to include any detailed discussion of regional food. This SEA report included a section on 'country food harvesting' that reviewed regional species that are harvested for food, and their relative significant. In the SEA section, it was stated: "For generations the people of the Labrador Shelf SEA Area have relied upon the harvesting of wildlife on the land and in the sea for much of their food supply". The SEA further discussed the species, and their relative importance to harvest, in terms of quantities obtained, evidenced as followed:

> In 1980-81, an evaluation of country food was conducted in Makkovik (Alton Mackey and Orr 1987). During the study year, it was found that the harvest of country food (or wild food) accounted for 28,738 pounds. It was found that Atlantic cod (2864 kg) and arctic char include trout (2830 kg) were the main traditional fish species harvested. Rock cod (1530 kg), salmon (1030 kg) and other fish species including herring, capelin, smelts, flounder, turbot, halibut, whitefish, redfish and sculpin (320 kg for all others combined) were also harvested for a total of 8754 kg or 30 percent of country food harvested (Alton Mackey and Orr 1987). Seals contributed 3170 kg or 11 percent of the country food harvested in this study but may be under reported as a result of the cultural practice of food sharing (Alton Mackey and Orr 1987). Bird species including non-marine birds accounted for 19 percent (5334 kg) of the country food harvest to the Makkovik traditional economy. The various species harvested were eider ducks (1896 kg), ptarmigan/grouse (1433 kg), Canada geese (754 kg) and black duck (527 kg).

This SEA had an advantage, in that a prior study was conducted for the area pertaining to the harvest of country food; other SEAs in this study, and beyond, may not have access to this type of resource, with its substantial backing of research. Nevertheless, an examination of relative importance of food species is important to the dimension of food security availability. SEA 5, thus, was determined to have considered this food security element the best, and was almost categorized as fully considered; however, the lack of direct discussion for food security was significant enough to downgrade its classification. It is impossible to identify the actual level of consideration for availability without the concept of food security having been introduced, including details of what role the region plays in food security. Full consideration for availability might include relative importance of food species to several aspects of food security, such as overall contribution to diet, importance of a local diet, cultural practices, or nutritional contribution, for instance.

Although the availability dimension was the best considered element of food security, and in some SEAs was almost categorized as fully considered, it is also important to note that a clear motivation underlying the assessment of the biological setting was largely that of conservation—whether for general sustainability of the species, or for conservation of commercial fisheries. A conservation agenda is inherently different than that of one that focuses on food security; availability of food requires consideration of food harvests for economic, cultural, health and sustenance purposes, in addition to biological conservation. Indicators employed for conservation purposes operate under different conditions and with a different agenda than what might be necessary of indicators that look at additional components of food security (Hardy, Béné, Doyen, & Schwarz, 2013). Therefore, because there is no direct consideration for food security in any of the SEAs analyzed, the current manner to which the biological setting is addressed in the SEAs may not be entirely compatible with food security assessment. Nonetheless, the discussion of the biological setting seems detailed enough in many of the SEAs that the inclusion of food security and the consideration of criteria for food availability would, seemingly, be a relatively minor addition.

5.1.2 Access

Food acquisition behaviours are often assessed in relation to food security access (A. D. Jones et al., 2013). Analyzing food acquisition behaviours provide insight into how and where food is harvested and the specific types of food acquired by communities, including food preferences and foods that might be socially or culturally important. Food security assessments do not typically split up the dimension of access, opting to consider physical, financial and social access together. For the purpose of this study, however, it was determined that aspects of the access dimension were exclusive enough to be considered separately recognizing, however, that some crossover is inevitable. Within the access dimension, financial access and social access elements, with scores below 33%, are detailed below.

5.1.2.1 Financial Access

Financial access refers to buying power and the ability of individuals or households to financially accumulate food. One major component of the access dimension of food security is that of household assets and entitlements (S. Maxwell, 1996). According to food security assessment literature, the financial component of access is often measured using food acquisition

behaviour surveys alongside an assessment of food prices and labor force characteristics (A. D. Jones et al., 2013). Focusing more narrowly on a bounded region, as recommended in phase one, financial components and barriers would be assessed in relation to regional food acquisition. In particular, input cost associated with harvesting regional food would be a major consideration for this element (i.e. gear, fuel, time, effort), which affect not only the financial ability to acquire food, but also the prices of regional food (Lamm & Westcott, 1981). Household assets of the regional community would also be important to consider (i.e. household income, savings, asset ownership (home or vehicle), mutual finds/stocks) which help establish vulnerability to food insecurity (Guo, 2011); therefore providing insight into potential level of impact (Cutter, Boruff, & Shirley, 2003; Morrow, 1999). Assessing input costs, household assets, and gauging vulnerability and risk were all also topics raised in phase one interviews and included in consideration criteria for this food security element.

For the most part, the 17 SEAs did not consider financial access well. All SEAs were categorized as having rarely or somewhat considered the food security element. In comparison with the other seven food security elements, financial access obtained the third lowest PTPS with 31% consideration.

Similar to that of many other elements, consideration for financial access within the SEAs was largely a result of their consideration for fisheries. Any discussion of harvesting methods, gear or effort was solely related to fisheries in all the SEAs except for SEA 5, which very briefly discussed costs association with time and effort costs related to harvesting country food beyond the fisheries. Accordingly, details examined in the majority SEAs related to financial access included some combination of the following aspects: fishing gear used; fishing gear used for various species and locations; landing values for various fishing gear types; fishing vessel types; number of licenses based on gear used; and historical changes to fishing methods. Beyond a discussion of those listed details, and an overview of the potential for fishing gear loss and damage, 13 of the 17 SEAs did not examine any additional aspects that would be relevant to financial access (SEAs 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, and 17).

The following excerpt from SEA 7 provides a good, yet concise, example of the extent of consideration for financial access within the 13 lower scored SEAs:

> A seabed survey (i.e., geophysical or geotechnical) or seismic survey (2D or 3D) will not interact with the offshore Sea scallop fishery which utilizes mobile fishing gear (i.e., offshore scallop rake) to target commercial-size scallops in beds on shallow areas of

> Georges Bank and the Scotian Shelf (i.e., not the deeper areas of the Scotian slope which underlies the NS11-1 lease block area (Refer to Figure 4). However, fisheries for large pelagic species such as Swordfish (and some tunas, shark species) and crustaceans such as Offshore lobster and Red crab overlap with the NS11-1 lease block area (Refer to Figures 5, 6, & 8). The large pelagics are fished predominantly with baited hooks on floating longlines (50-60 km in length) while the latter are fished using large traps (i.e., fixed gear). Seismic survey vessels with a large array of seismic streamers have the potential to interact with both of these gear types. However, longline vessels follow the large pelagics as they move along the Shelf edge as they enter Canadian waters in the spring from Georges Bank, to the Scotian slope and to deeper areas of the Grand Banks and back again in the fall. Offshore lobster and Red crab fisheries are fished under an Individual Transferrable Quota (ITQ) system and therefore can be fished at any time during the year. Fisheries interests have shown in the past their capability and willingness to avoid potential interactions with seismic and exploration drilling activities.

Some variation persisted within the 13 SEAs regarding the specific fisheries details discussed and the extent to which the details were discussed, but all were still limited in their consideration for the food security element of financial access. Nonetheless, the consideration for fisheries gear and harvesting methods, which directly relate to costs of food acquisition, represented some consideration for the food security element, albeit slight.

The four SEAs that were categorized as having somewhat considered financial access include SEAs 5, 14, 15 and 16, obtaining a scale point score of two. SEA 5 obtained the higher level of consideration scale point for briefly discussing costs associated with harvesting food beyond that of fisheries, as was previously mentioned. SEAs 14, 15 and 16 all obtained a higher level of consideration scale point classification because they included details related to the regional economy. Some of the economic details included in these three SEAs that were pertinent to financial access included: employment details; unemployment levels; per capita income; and a summary of the workforce. Both SEAs 14 and 15 included discussions of all those listed details, helping to characterize the community's purchasing power and vulnerability, as well as the relative importance of the fisheries to the economy. SEA 16 was less detailed in coverage of income and employment details, however, its consideration for financial access was greater than the other 13, given its consideration related to harvest input costs, such as gear damage or loss and displacement from harvesting locations, and its discussion of the relative economic importance of various marine activities within the region. Clearly there is some consideration for the element of financial access within the SEAs, but there remains a substantial void between its current level of discussion and its full consideration.

5.1.2.2 Social Access

A final element of the access dimension of food security is social access. In a context of regional food security, social access correlates to acquiring regional food in a socially and culturally acceptable manner; thus, gathering food using socially and culturally important methods, and having access to foods that are socially and culturally important (Leroy et al., 2015). The importance of understanding social barriers and historical social conflict was also brought up in phase one as a critical consideration for this element of food security and is additionally underscored in food security literature. For example, Briones Alonso et al. (2018) suggest that structural exclusion to food, and food insecurity, can be an outcome of social exclusion and discrimination. The authors further note that Indigenous peoples may be at heightened risk of this type of exclusion; a finding that is pertinent to this thesis research, as Canadian SEAs conducted when planning for natural resource development are often carried out in territory that house Indigenous populations (O'Faircheallaigh, 2013). Indigenous populations in Canada, additionally, are more likely to rely on their surrounding ecosystem for food security (Power, 2008). Therefore, social access is an important and potentially principal element influencing food security of those populations within an SEA region—affirming the importance for its consideration in SEA practice.

Social access was generally found to be not well considered in the SEAs, obtaining the second lowest PTPS for consideration of the food security elements: 28%. Consideration for social access was the most varied among SEAs, however, with one of the SEAs having largely considered this element, and two having not consider it at all. The majority of SEAs (12 of 17) rarely considered social access (receiving a scale point score of one), while the two remaining SEAs somewhat considered the element (receiving a scale point score of two). Overall, it was clear that consideration for the element was poor, yet the range of consideration among SEAs is notable.

The twelve SEAs that rarely considered social access (SEAs 2, 4, 6, 7, 8, 9, 10, 11, 12, 13, 15, and 17), obtained the low score because consideration for the element was latent and minimal. By and large, the only reference to socially important food or culture surrounding food acquisition in those SEAs was related to cultural importance of fisheries; any further discussion of was minimal. A couple of the SEAs directly, although briefly, mentioned the historical and cultural importance of fisheries to the regional communities (SEAs 2 and 4). Because of that, and

because of a relatively elaborate assessment of fisheries in these two SEAs, any mention of issues related to fisheries access within the SEAs—be it species, areas of importance to harvest, or harvest methods—would, theoretically, pertain to social access; the linkage was, however, not directly made within these SEAs. Consideration of fisheries in a context of culture and social history was also observed in several other SEAs. Three SEAs (SEA 7, 15, and 17) reference traditional fishing grounds as well as fisheries species important for ceremonial purposes; and seven SEAs discuss cultural or traditional significance of "Aboriginal fisheries" (SEA 6, 8, 9, 10, 11, 12, and 13). Similar to SEAs 2 and 4, however, discussions pertaining to social access in all nine of those SEAs were also, peripheral and brief.

For the most part, any direct discussion related to social access within the 12 SEAs that obtained a low scale point was limited to one or two referential sentences. For example, the only pertinent section to social access within SEA 6 is provided in the following fragment:

> The Conne River Band Council participates in Food, Social and Ceremonial fisheries as well as Communal/Commercial fishing activities within the SEA Area. … Catches taken under this communal arrangement are distributed to the elders or to disabled persons in the community. As part of the food fishery, individual Band members can fish cod and other groundfish, herring or mackerel; lobster may also be taken as part of the ceremonial fisheries.

Similarly, SEA 7 included the following excerpt when outlining the commercial fish and fisheries VEC:

> The focus of the assessment of the VEC is to be on potential disruptions to commercial fishing activities through environmental effects on fisheries resources, displacement from current or traditional fishing areas, or gear loss or damage resulting in a demonstrated financial loss to commercial fishing interests.

Within SEA 7, reference to traditional fishing areas was mentioned a total of five times in relation to potential effects of petroleum exploration within that SEA, but each reference was similarly succinct. Nonetheless, the consideration for cultural, traditional or ceremonial importance of fisheries was present within the 12 SEAs, even if minimal.

The two SEAs that were categorized as having somewhat considered social access (SEAs 14 and 16) referenced culture and social importance, similarly, only when discussing fisheries. Discussion of cultural and social significance of the fisheries within these SEAs was, however, more detailed and direct than many of the other SEAs. For instance, the following excerpt from SEA 14 showcases how that connection between fisheries and culture was made:

> Marine fisheries are an important component of the socioeconomic environment of Newfoundland and Labrador and other parts of Canada, including the various communities and regions which surround the Gulf of St. Lawrence. The fishery has played a key role in the region's history, and thus in shaping its people, communities and overall culture. It continues to be an essential element of the economy and lifestyles of the people that live in these areas. Numerous individuals and organizations depend on fish harvesting and its associated processing and spin-off industries, with many residents participating in recreational and subsistence fishing as an important aspect of their culture and overall way of life. Aboriginal people and communities throughout the Gulf of St. Lawrence also continue to undertake fishing activities for commercial or traditional purposes, and many groups have depended on the resources of the sea to sustain their people and cultures for generations.

The social significance of fisheries within these both SEA 14 and 16, as related to culture, socio-economic history, and general social wellbeing, was referenced several times throughout the SEAs. With that clear connection made, any examination related to fisheries access within the two SEAs inherently applied to social access. The two SEAs did not, however, include reference to any other food species, areas of harvest, or acquisition methods beyond that of fisheries.

The only SEA to incorporate a detailed account of regional food harvesting was SEA 5. Within its assessment, the pertinence of regional food and harvesting of country food to social and cultural wellbeing was highlighted. The section included a discussion of fisheries species, as well as other foods harvested, including marine mammals, marine and coastal birds, coastal land animals, and plant foods (i.e., berries). Furthermore, access to country foods and its relevance to social wellbeing was directly mentioned in the SEA, exemplified with the following excerpt:

> Access to country food- or wild food, (the term use for food that is utilized by traditional harvesting) continues to be important not only to the economy but also to the health and social well-being of families.

Discussions of geographical locations important to food harvesting, harvesting methods, and historically employed harvesting methods were examined. SEA 5, as such, was categorized as having largely considered the social access element of food security. Similar to the categorization of this SEA for food availability, this SEA could not obtain the greatest score of 4 for fully considering social access, because nowhere was food security explicitly discussed. Additionally, there was no reference to social barriers, social opportunities, or past social conflict within this SEAs. While the SEA may have considered many aspects of social access pertinent to regional food security, its lack of direct consideration for food security and deficient

investigation of social barriers or opportunities leads to uncertainty. Nonetheless, the degree of consideration for social access within SEA 5 was significant in comparison to the other SEAs.

Consideration for social barriers or opportunities, as well as potentially lasting historical conflict, was extremely limited within all the SEAs. No discussion of prejudice, conflict or discrimination were included in any of the SEAs, and within eight of the SEAs (SEA 4, 6, 8, 9, 10, 14, 16 and 17), the only reference to potential social opportunities was a very brief mention of case law and resulting legislation connected to Aboriginal rights to hunt or fish for food, social and ceremonial (FSC) purposes. Within four of those eight SEAs, an overview of the court rulings and resulting legislation was outlined (SEA 8, 9, 10 and 17), each explaining that communal fishing licenses were an institutional response to the court recognized rights for Aboriginal peoples to hunt and fish for FSC purposes. All eight of the SEAs discuss the existence of communal licenses within the region, but do not discuss the topic much, if at all, beyond the original reference, opting, instead, to lump "communal fisheries" details in with more general discussion of "fisheries". While the application of case law seems to provide some improved social access to food for the Canadian Indigenous population, its discussion within the SEAs was peripheral and referential; furthermore, there was no discussion of issues or conflict that preceded the supreme court rulings. Consequently, the discussion pertaining to social barriers and opportunities within those eight SEAs was minimal enough to have little impact on their classification within the document analysis. Nonetheless, the inclusion of case law and legislation is an important inclusion, as it influences social access, and the eight SEAs that do include slight discussion of social opportunity provide some insight into where and how the inclusion of social barriers and opportunities might be incorporated within SEA documents: within characterizations of the socio-economic environment. [10]

[10] A selection of words related to social access show interesting results that might provide insight for future research. A selection of ten words (and their stemmed words) were reviewed to identify degree of use in the 17 SEAs (appendix H provides a table showing the ten selected words and the word count totals for the 17 SEAs). The SEAs that considered social access the least commonly had very low word counts for the selected words related to culture and social matters. For instance, the two SEAs categorized as having not considered social access at all contained the lowest word count total for the ten selected words and their stemmed words. Likewise, those that considered the element the most incorporated the greatest number of those words within the SEA documents. Similar tendencies were observed for certain individual words (and their stemmed words). For example, the use of 'cultur*' was incorporated most in the three SEAs that considered social access the best and was incorporated in the two lowest scoring SEAs the least. The same trend was observed for use of 'tradition*'. Word count totals did not play a role in categorization and scoring of the SEAs for any of the food security elements, since words commonly applied to topics beyond food security; nonetheless, the finding shows how certain word usage might be an indicator for the extent to which food security is considered in SEAs and might be a topic worthy of future research.

5.1.3 Utilization

The utilization dimension of food security is a relatively complex dimension consisting of a wide range of considerations. Utilization is largely concerned with the output or outcomes of a food system, including nutritional or health outcomes of consumed foods, and community health outcomes related to food—often a product of the ability to engage in culturally or socially significant practices or traditions surrounding food, or in their more general food practices (Carletto et al., 2013; Coates, 2013). Economic contribution of food or the food industry, is also a component of food security, although more indirect, to those populations that are dependent on regional food production for their livelihood (Béné, 2006).

Food quality and nutritional outcomes of food are often the principal consideration when utilization is discussed in the context of food security (Carletto et al., 2013; Coates, 2013; Ericksen, 2008). The importance of a nutritional component has, further, become one of the most significant in food security discourse, as it is one of the most relevant to human health, next only to adequate food intake. Although the SEAs scored moderately in their consideration for the element of food quality/nutritional utilization, and will therefore not be discussed in detail, it seemed important to note that any consideration for this element within the SEAs was largely due to concern for fish, or other species or habitat, contamination. The element was, therefore, dominated by fisheries concerns, as was common to many of the food security elements. Fish contamination is important to this element but is only a piece.

Consideration for human health, generally, within the SEAs was rare. None of the 17 SEAs reviewed the human health situation of nearby communities, and in regard to regional food consumption there was minimal direct consideration for human health. A selection of word count quantities related to human health and nutrition showed very limited word usage. Some words, such as “health” or “healthy” were used often throughout some of the SEAs but were not used in relation to human health. When including only those words, in count totals, that were used when referencing human health, and therefore contextually relevant to food security, word count quantities related to human health and nutrition were found to be either devoid or extremely low within the SEA documents; thereby, denoting that reference to human health and nutrition was, likewise, rare (see appendix I for word count totals related to human health and nutrition in the SEAs).

Overall, utilization was poorly considered in the 17 SEAs analyzed for this research; although, there was considerable variation in the degree of consideration for the three elements of utilization. The combined PTPS for the utilization dimension was only 38%. Food quality/nutritional utilization and economic utilization, comparatively, performed better; with PTPSs of 44% and 50% respectively. Cultural utilization was the poorest considered element of all eight food security elements, with a PTPS of 21% and is further detailed below.

5.1.3.1 Cultural Utilization

Cultural utilization refers primarily to uses and practices surrounding or involving food that have social or cultural value (Ericksen, 2008; Loring & Gerlach, 2009). This element of food security is inherently related to social access but is focused on outcomes and utilization of food as opposed to inputs, or practices involved in acquisition. In this manner, specific consideration related to this food security element might include cultural and social practices that involve regional food (beyond acquisition and harvest); traditional diet and profile of food history (if pertinent to cultural histories); and ceremonies or celebrations surrounding or critically involving regional food.

Cultural utilization was the poorest considered food security element within the 17 SEAs analyzed. The combined PTPS of all SEAs for this element was a meager 21%. Five of the 17 SEAs did not consider cultural utilization at all (SEAs 1, 2, 3, 4, and 7), ten of the SEAs rarely considered the element (SEAs 6, 8, 9, 10, 11, 12, 13, 15, 16, and 17), and two of the SEAs considered it somewhat (SEAs 5 and 14).

Those SEAs that obtained a score of zero for not considering cultural utilization at all were devoid of any discussion surrounding social or cultural use of food, be it ceremonial use, traditional diet, or culturally important foods. Additionally, there was no discussion of culture even in a general sense. Those SEAs that obtained a score of one for having rarely considered the element, included very cursory references to food and culture. The only text somewhat pertinent to cultural utilization within SEA 6, for example, included the following two excerpts:

> The Conne River Band Council participates in Food, Social and Ceremonial fisheries as well as Communal/Commercial fishing activities within the SEA Area. Information describing these fisheries was provided for the Sydney Basin SEA in JW (2007) and is provided below.

and

> The lobster fisheries, though comparatively low in quantity, are of high economic and social value, and are particularly important to local SEA Area-based fishers who typically harvest this species in waters near their home ports.

Similarly, SEAs 8, 9, 10 and 17 merely explained that court mandated rights exist in the region for Indigenous groups to hunt or fish for food, social and ceremonial reasons, in which communal fishing licenses contribute to enact that right. Legislation and case law pertaining to food acquisition is a consideration more directly relevant to social access; however, the inclusion of the excerpt "for social and ceremonial reasons" makes it also pertinent to cultural utilization. These SEAs reviewed the number of communal licenses in the SEA areas, however, did not elaborate on any additional details. The ten SEAs categorized as having rarely considered cultural utilization, obtained a score above zero because there was some reference to cultural use or social importance of food, as cursory as it was. It is worth noting, however, that reference to topics relevant to cultural utilization of food within these SEAs was very limited and only marginally above those that did not consider the element at all. One exception was SEA 16 which referenced the cultural importance of fisheries a fair bit throughout the SEA; this consideration was, however, referential, did not delve much into cultural utilization, and was more related to social access—where its reference to cultural importance was accounted for in its classification.

The two SEAs that were classified as having somewhat considered cultural utilization of food, obtaining a score of two, included more detail pertaining to cultural importance of food. SEA 5 and 14 included a review of the species that have cultural importance to nearby communities, and that are important to traditional diets. Within its section on country food harvest, SEA 5 reviewed which foods are important to traditional or cultural diets, expressing that country food was culturally important. Likewise, SEA 14 included a review of various fishery and bird species that are economically, socially and culturally significant to regional Indigenous communities. SEA 14 also mentioned that celebrations and festivities celebrating or including regional food were culturally important to coastal communities. The two SEAs did not, however, include many details related to those ceremonial or cultural practices surrounding food, nor did they include a detailed overview of general culture or cultural practices of nearby communities, missing a number of key consideration criteria for the element, and making it difficult to gauge the risk of potential impacts. This limited or lack of discussion surrounding culture of nearby communities was found in all 17 SEAs. Nonetheless, the two SEAs that

obtained the higher classification did discuss more aspects of culture, occasionally outlined species of importance, and therefore, more substantially considered the cultural utilization element. [11]

5.1.4 Stability

Stability is the final dimension of food security: the dimension that encompasses all other dimensions. Sustainability and security of the other three food security dimensions are at the core of the stability dimension (Barrett, 2010). Vulnerability, risk and resiliency are also important considerations when examining the stability dimension of food security (A. D. Jones et al., 2013). As it was implied within phase one interviews, and in congruence with literature, a characterization, or profile, of vulnerability should be established during a food security assessment in RSEA to identify vulnerable populations, as well as to gauge risk of potential development and resiliency to impacts. Understanding the current health, economic, socio-political and environmental situation was noted, in phase one, is vital to understanding weaknesses or susceptibility to negative impacts. A vulnerability profile may include: a characterization of a population's health, economic and socio-political situation; historical characterizations of various societal and environmental matters to assess how impacts have been felt in the past as well as to identify potential cumulative effects; institutional response capacity and emergency supports; and strategies in place to conserve relevant environmental resources or cultural practices. Overall, the stability dimension was considered to a moderate degree in the analyzed SEAs, with a PTPS of 41%, largely due to the nature and purpose of SEAs being forward looking and aimed at sustainability. Vulnerability profiles, however, were not included in any of the SEAs, and socio-economic characterizations were either absent or limited.

[11] The quantitative word count results for the same words that were relevant to social access are also interesting in their relation to cultural utilization. Those words, likewise, seem somewhat indicative of the degree cultural utilization was considered in the 17 SEAs (see appendix H for the table showing word count totals for selected words related to culture in the 17 SEAs). The two highest scoring SEAs, for the consideration of cultural utilization, contained a significantly greater quantity of the selected words. The remaining SEAs had substantially lower total word counts, with the exception of one (SEA 16). The results suggest that there is some association between word count quantities and the level of consideration for cultural utilization, as was the case with social access. Again, future research may examine if word count quantities within SEA documents are, in actuality, associated with the consideration for various issues, including, but not limited to, culture and food security.

5.1.5 Overall consideration for food security

The consideration for food security in a holistic and context-specific manner was emphasized in phase one research, as well as within food security literature. Collective and complete consideration of the food security elements and dimensions would, therefore, be critical for adequate consideration of food security. Because food security is not directly discussed within the SEAs, it is impossible to know the full extent to which food security is addressed in the SEAs analyzed. The nature of and specific factors related to food security and the actual role of the regional food system must first be established in order to understand the full extent it is addressed. Some consideration for all food security elements was evident the SEAs analyzed, despite the lack of explicit consideration for food security or full consideration for food security in any of the analyzed SEAs. However, major omissions related to the consideration of food security elements make it clear that significant deficiencies in the overall consideration of food security remain.

The fact that food security was not explicitly considered in the 17 SEA analyzed, is somewhat surprising because fisheries have historically played a fundamental role in regional food systems and food security for coastal Canadian communities, and still do to the present day (Lowitt, 2014). Consideration for food security should, seemingly, thus, be forefront issue. While much of the consideration for food security within the SEAs was related to fisheries, direct reference to food security was absent, and considerable deficiencies remained with regard to consideration for food security elements. This finding, therefore, suggests that food security is not a priority in environmental governance processes, despite it being a sustainable development goal for Canada, and many other countries around the globe (United Nations, 2015a). This finding further suggests that SEA practice is falling short in its goals to advance sustainable development, since food security is now regarded as a major component of sustainability.

The most glaring deficiencies, in the consideration for food security in the SEAs, were related to the sociological environment. The lowest scoring food security elements were social access and cultural utilization, followed closely by financial access—all socio-economic topics. The only element to be considered highly was availability. Many of the consideration criteria for availability pertain to the agroecosystem, productivity and supply of food species. The element of availability is, therefore, most associated with the biophysical environment, much more than any of the other food security elements. This finding is consistent with literature examining SEA

practice, much of which suggests SEA practice disproportionately focuses on the biophysical environment (see T. Fischer & Gazzola, 2006; Gunn & Noble, 2009; Lobos & Partidario, 2014). An emphasized focus on the biophysical environment suggests SEA is lagging behind its conceptual evolution, in which sustainable development is understood as the underlying objective of the process (Lobos & Partidario, 2014). The remaining four food security elements all scored moderately (stability, food quality and nutritional utilization, physical access, and economic utilization), however the difference between the highest scoring food security element, availability (which obtained a PTPS of 71%), and all other food security elements is significant—a 21% difference is observed between availability and the next highest considered food security element (economic utilization). This is further evidence of a clear discrepancy between consideration for the biophysical environment and the socio-economic environment in the SEAs. Socio-economic environmental considerations appear to not be prioritized to the same degree that physical environmental is in Canadian SEA practice. The development of SEA has, theoretically, expanded in scope from a more constrained focus on the biophysical environment to that of sustainable development (Tetlow & Hanusch, 2012), but this does not seem to be reflected in practice.

Consideration for health was another matter related to food security that was extremely limited in the SEAs analyzed that should have been an automatic inclusion. As discussed in chapter two, health is now regarded as an important consideration within SEAs, and is even mentioned in various international legislation, directives or guidelines—including the Canadian SEA directive. Failure to integrate health within SEAs contributes to substantive and procedural deficiencies with the SEAs (T. Fischer et al., 2010), likewise failing to meet its objectives to advance sustainable development.

It was clear from the breakdown of elements that substantial variation in the consideration for food security existed amongst SEAs. Those SEAs that best considered food security obtained a PTPS of 59% (SEAs 5 and 14), while the SEA that considered food security the least obtained a PTPS of 22% (SEA 1). The specific reasons why some SEAs performed better than others in the consideration of food security is valuable to informing procedural improvements. One possible explanation is explored in the next section (utilization of public participation). What is clear at this stage, however, is that those SEAs that were more comprehensive in their consideration of food security elements, earning higher classifications

and scores, adopted a broader level of analysis from that of narrowly focusing on VECs. Clearly observed from the finding of this analysis was that VECs are critical in guiding the remainder of the assessments; however, expanding the scope of the SEAs to look more broadly at larger environmental characteristics and issues may result in a more comprehensive assessment that looks beyond constraints of selected VECs, and capture important environmental components that may have otherwise been missed. The SEAs that better considered food security often looked outside of the fisheries, capturing species and activities that may be important to regional food security. Additionally, the SEAs that better considered food security included some, albeit constrained, characterizations of socio-economic aspects.

To better consider food security, beyond simply directly considering it, the SEAs would need to include broader socio-economic profiles with health, culture, diet, social behaviors, social barriers and opportunities, and the regional economy characterizations. Those considerations would, furthermore, need to be carried through to impact analysis and decision-making. Although there may be some obscure challenges in establishing those characterizations, socio-economic profiles are already an evident feature of Canadian SEA. Notable omissions within the 17 analyzed SEAs are the lack of direct consideration for food security and health, as well as the limited characterizations of the socio-political environment; however, there were some notable accomplishments in the consideration for various food security elements, as demonstrated by their integration of fairly elaborate characterizations of relevant features to their selected VECs. Holistic consideration of food security into SEA and RSEA may not be tremendously cumbersome, with slight reframing.

5.2 Integration of procedural components for effective food security assessment in SEA documents

Two procedural components were determined to be important enough to examine as part of the SEA document analysis: (i) public participation; and (ii) employment of pathways or system analysis. The importance of these procedural requirements arose during phase one research and, therefore, were integrated following initial methodology development, presented in chapter 3. This section proceeds first with an investigation of public participation use within the 17 SEAs documents, followed by an overview of the use of a pathways or systems analysis in the SEAs.

5.2.1 Public Participation

For the provision of an effective food security inclusive RSEA, phase one interviewees emphasized that substantial opportunity for public participation should be provided throughout SEA processes, both in input opportunity and in influence. An evaluation of public participation within current SEA practice is, therefore, suggestive of how SEA is currently fulfilling a procedural requirement for effective food security assessment in practice. As it was noted in chapter four, meaningful public participation is a longstanding requirement for SEA, yet considerable research suggests that public participation in SEA practice is deficient (see Aschemann et al., 2016; Gauthier et al., 2011; Rega & Baldizzone, 2015). Findings from the document analysis of SEAs provided additional insight into specific public participation deficiencies related to the application of effective food security assessment.

Based on the findings from phase one, the following ingredients for public participation were recommended for effective food security assessment in RSEA:

- participant selection is focused on vulnerable populations;
- public participation employs high levels of intensity in which a high level of opportunities for input is provided;
- public participation is highly influential; and
- public participation is integrated often and throughout the SEA stages.

Data from the 17 SEAs analyzed in this phase of research related to public participation were organized into six related analysis criteria: (i) public participation format; (ii) participation selection; (iii) participation interaction and communication methods; (iv) influence of the public participation process; and (v) stages public consultation; and (vi) incorporation of vulnerable populations (see appendix J for a summary of the public participation in the 17 Canadian SEAs). The data were then analyzed alongside the above recommended ingredients for public participation and categorized based on the extent to which they meet those recommendation criteria. For this categorization, a 4-point magnitude scale was utilized, as followed: 0 – does not meet the recommendation criteria; 1 – minimally meets the recommendation criteria; 2 – somewhat meets the recommendation criteria; 3 – meets the recommendation criteria. Table 5.3 presents the results of the SEA document analysis regarding public participation categorization.

Table 5.3 Incorporation of recommended public participation components for an effective food security inclusive RSEA in 17 Canadian SEAs

Criteria / SEA	High level of intensity & input opportunity	High level of influence	Integrated in multiple stages	Integration of vulnerable populations	Total Score (out of 12)	Percentage of all criteria met by SEA
1	0	0	1	0	1	8%
2	1	0	2	1	4	33%
3	1	1	2	1	5	42%
4	2	2	3	1	8	67%
5	3	2	3	2	10	83%
6	1	2	2	1	6	50%
7	0	0	2	1	3	25%
8	1	1	3	1	6	50%
9	1	1	3	1	6	50%
10	1	1	3	1	6	50%
11	1	1	3	1	6	50%
12	1	1	3	1	6	50%
13	1	1	3	1	6	50%
14	2	2	3	2	9	75%
15	2	2	3	1	8	67%
16	1	2	2	1	6	50%
17	0	0	1	1	2	17%
Total Score (out of 51)	19	19	42	18		
Percentage of criterion met	37%	37%	82%	35%		

0	Does not meet recommendation criteria
1	Minimally meets recommendation criteria
2	Somewhat meets recommendation criteria
3	Meets recommendation criteria

With the evaluation of public participation in the 17 SEAs wholly based on the SEA documents, it is conceivable that greater levels of public participation were utilized in the SEA processes than were specified in the SEA documents. Transparency and level of detail that surrounded public consultation within the analyzed SEA documents varied substantially. Some SEA documents included comprehensive and detailed accounts of the consultation process, influence and detail, whereas others were very restrained in the details reported. However, effective public participation in SEA generally includes transparency and reporting of participation processes and utilization (Aschemann et al., 2016). Thus, based on certain SEA evaluation standards, a SEA's employment of public participation could be regarded as insufficient if lacking transparency. Applying a more thorough evaluation that integrates an extensive investigation into transparency and influence would demand a more elaborate

methodology than was employed in this research.[12] However, because this particular investigation was secondary to the initial research design, and because the product of this particular investigation is intended more as an overview, the level of reporting pertaining to public participation within the 17 SEAs was deemed sufficient for this evaluation.

Based on the documents, the level of public participation varied significantly amongst the 17 SEAs. Some degree of public participation was employed in all the SEAs; however, a few seemed to integrate a very minimal extent while others were much more encompassing of public engagement. Using the same form of scoring system that was applied for the analysis of food security elements in the previous section, the SEAs were scored based on how well they met the specified recommended public participation criteria. A percentage of the total possible score (PTPS) for the level to which criteria were met by the SEAs ranged from 8% to 82% (public participation criteria total score, of a maximum 12, converted to a percentage), suggesting that the SEAs utilized a broad range of public participation approaches that employed varying levels of compliance with recommended criteria for public participation. The strongest criterion for public participation observed within the SEAs was in their integration of public participation in various stages of the SEA process (with 82% of that criterion met to its fullest degree, where total maximum score was 51). However, levels of intensity and input opportunity, the level of influence, and integration of vulnerable populations all obtained substantially lower PTPSs (39%, 37% and 35% respectively), suggesting that considerable adjustment to public participation is needed in SEA practice to align with the recommendations for effective assessment of food security set forth by food security experts.

Level of intensity and input opportunity. Intensity in public participation is typically associated with the level of interaction between participants and administrators. More intense processes provide more opportunities for input, and are often less inclusive and less representative of the larger population, engaging with more select subsects of the population (National Research Council, 2008). A high level of intensity was emphasized by the interviewees in phase one of this research, not just in timing (throughout the process) and in the participatory

[12] In their research, Nadeem and Fischer developed an evaluation framework for assessing public participation in EIA in Pakistan which was developed following a literature review, a review of relevant provisions and guidelines, and interviews with EIA practitioners, EIA experts, and government officials. The resulting evaluation framework analyzed 41 attributes of public participation and conducted interviews with 40 stakeholders for each EIA case study analyzed, in addition to EIA review, to apply their public participation evaluation framework.

forms (face-to-face interactions and interviews) but also in their participation selection recommendations (more selective and focused on the more vulnerable population.

Level of input opportunity and intensity of public participation are largely dependent on participation format. Public open houses, for example, are typically open to the public, participants are self-selected, and the interaction between participants and practitioners is minimal, commonly intended to consider views of participants, but not so much in gathering meaningful information (Fung, 2006; National Research Council, 2008). Table 5.4 provides an overview of the participation formats employed during the 17 SEAs, also showing the modes of communication afforded to participants, and participant selection methods.

Table 5.4 Public participation formats, modes of communication and participant selection methods in the 17 SEAs

Factor / SEA	Format				Mode of communication				Participant selection method				
	least intense → most intense				least intense → most intense				least intense → most intense				
	Public comment period	Public open house	Public meeting(s)	Stakeholder engagement	opportunity to express preferences	opportunity to express opinions and develop preferences	Opportunity to employ expertise	Opportunity for extensive back and forth discussion	unspecified	diffuse public sphere (i.e., social media)	open, self-selected	open with targeted recruitment	targeted recruitment of lay and professional stakeholders
1	✓				✓				✓				
2	✓			✓	✓	✓					✓		✓
3	✓			✓	✓	✓					✓		✓
4	✓			✓	✓	✓	✓				✓		✓
5	✓		✓	✓	✓	✓	✓	✓			✓	✓	✓
6	✓			✓	✓	✓							✓
7	✓			✓	✓				✓				
8	✓			✓	✓	✓					✓		✓
9	✓			✓	✓	✓					✓		✓
10	✓			✓	✓	✓					✓		✓
11	✓			✓	✓	✓					✓		✓
12	✓			✓	✓	✓					✓		✓
13	✓			✓	✓	✓					✓		✓
14	✓	✓		✓	✓	✓	✓				✓	✓	✓
15	✓	✓		✓	✓	✓	✓				✓	✓	✓
16	✓	✓		✓	✓	✓					✓		✓
17	✓				✓					✓		✓	

Overall, levels of intensity and input were generally low in the 17 SEAs analyzed. A majority of participatory forms carried out in the SEAs were characteristically low in intensity, seeking to gather limited input from the public or stakeholders with minimal interaction with

administrators. For example, each of the 17 SEAs conducted a public comment period following the release of a draft of the SEA. Participation in final stages of decision-making processes, however, do not provide substantial opportunities to influence decision outcomes, and are consequently considered low intensity (National Research Council, 2008).

SEAs 1, 7 and 17 scored particularly low (receiving a score of zero for not meeting recommendation criteria) due to their lack of in-person participation, seeking only to collect written comments (SEAs 1 and 17, sought written comment only following a draft SEA, and SEA 7 in both the scoping stage and following a draft). A lack of face-to-face interaction may be interpreted as a lack of participation, since face-to-face interactions are considered "the heart of participation processes" (National Research Council, 2008, p. 126).

The majority of SEAs (10 of 17 – SEAs 2, 3, 6, 8, 9, 10, 11, 12, 13 and 16) minimally met recommendation criteria for level of intensity, obtaining low scores for the criterion. These ten SEAs made some effort to collect meaningful input, each encouraging some interaction with participants, but the purpose of participatory exercises was intended more for collecting feedback, or raising concerns and questions, as opposed to informing decision-making. An exception within these ten SEAs, and the remaining four, was in their stakeholder engagement, which was more intensive with generally more data sought, but was still limited in intensity due to the timing and influence of engagement (discussed in more detail below). Three SEAs (SEAs 4, 14, and 15) sought somewhat greater levels of public participation with more opportunities for participation provided, including public open houses in early stages of the SEA process (in SEAs 14 and 15), encouraging interaction and providing more opportunities for the public to raise issues of concern or provide expertise. These three SEAs, therefore, were categorized as having somewhat meeting recommendation criteria, but the intensity remained low, as the interaction within those three SEA processes was still limited. Only one SEA was categorized as having met the recommendation criteria (SEA 5) due to its extensive efforts to consult with the public throughout the SEA process, having conducted several one-on-one interviews, as well as a number of more open participatory processes, to gather information.

Opportunity for input in decision-making processes is also critical for highly intense public participation. For instance, public meetings and open houses were included in a few of the SEA processes. Five of the 17 SEAs explicitly mention some form of open public meeting (SEA 3, 5, 14, 15 and 16). The timing, purpose and number of public meetings, however, varied within

the SEAs. SEA 5 was extensive in their public consultation, and conducted two rounds, each with a number of individual public meetings. SEAs 3, on the other hand, was limited in the use of public meetings, using solely as part of the public comment period following the completion of a draft SEA. More regular participatory opportunities, as well as early participation opportunities are associated with heightened intensity, thereby influencing the categorization of the SEAs; however, public open houses formats are still associated with lower intensity and therefore only slightly influenced SEA categorization.

Stakeholder engagement is generally associated with higher intensity, depending on the specific participatory mechanisms employed, as the data collected in stakeholder engagements are more typically used to inform the decision-making processes (National Research Council, 2008). All SEAs but one (SEA 1 being the exception) specified some level of stakeholder engagement, be it professional stakeholders (paid representative of organizations or interest groups) or lay stakeholders (unpaid representatives of an interest group or community with a vested interest and willingness to dedicate considerable time and energy). The primary purpose of the stakeholder engagements specified within the SEAs was typically to gain input on issues of concern, to ask questions; and, occasionally, to provide background information or technical expertise.

Fifteen of the 17 SEAs included a moderate to significant level of stakeholder engagement (SEAs 2-16). In person stakeholder meetings were the most common form of stakeholder engagement, but telephone interviews and emails were also exchanged in the development of the SEA reports or to provide follow-up information. Timing of stakeholder engagement also varied in the SEAs. Ten of the 17 (SEAs 4, 5, 8, 9, 10, 11, 12, 13, 14 and 15) conducted stakeholder engagement throughout the SEA process. SEAs 2, 3, 6, 7 and 16 conducted stakeholder engagement only in the scoping phase and following completing of a draft SEA. In regard to stakeholder engagement, SEAs 1 and 17 stood out in their limited integration of stakeholder consultation. SEA 1 did not mention stakeholders or interest groups at all in the SEA, and SEA 17 merely distributed the draft SEA to various organizations for an opportunity to comment following completion of the draft SEA. SEA 17 discusses the importance of stakeholder engagement but suggested that it is most important in project-level assessments, perhaps to justify their limited engagement, as stakeholder engagement was typically emphasized in the SEAs as an important procedure in the SEA process. This particular comment made within

SEA 17 goes against SEA best practice, which suggests that public engagement should occur at early and regularly (Andre, Enserink, & Croal, 2006).

While the format and modes of communication play a major role in intensity and input opportunity of public participation, the timing and influence, and to some extent the nature of participants (i.e., inclusion of those most likely to be impacted by decision outcomes), of participatory mechanisms also play a role in the intensity of participation exercises. All three of those dimensions (timing, influence, and participant selection) are discussed below and all also contributed, somewhat, to the intensity classification of the SEAs.

Timing. More successful public participation processes are generally associated with the incorporation of participatory mechanisms throughout a decision-making process, from early scoping stages all the way through to completion. Provision of more opportunities for participation is also associated with heightened intensity and stronger influence of public participation in decision outcomes (National Research Council, 2008). Findings from phase one additionally highlighted the importance of incorporating public participation into RSEA throughout the process, for the purpose of considering food security. As such, the recommendation criteria related to timing of public participation mechanisms pertain to its integration in multiple stages of the SEA process.

Table 5.5 shows the stages that participation was utilized within the 17 SEAs. As can be observed within the table, public participation mechanisms were incorporated into all SEA processes; therefore, all SEAs scored above zero for this analysis criteria. Those that integrated public participation only in the late stages of SEA, following the draft SEA, were categorized as having minimally met recommendation criteria (SEAs 1 and 17). Although there was some effort to integrate public participation, it seemed to be only carried out as a regulatory requirement within the two lowest categorized SEAs. Five SEAs (SEA 2, 3, 6, 7 and 16) were categorized as having somewhat met the timing recommendation criteria because the integration of participatory mechanisms included early and late stages of the SEA process; however, participation seemed to be limited to only scoping stages and final stages of the SEA process. The remaining ten SEAs (SEA 4, 5, 8, 9, 10, 11, 12, 13, 14 and 15) were categorized as having met the recommendation criteria for timing because they all integrated participatory mechanisms throughout the process. Although the influence, intensity and participant selection varied

amongst these ten SEAs, they all incorporated public participation into various stages of SEA to earn a full score of three for the analysis criteria.

Table 5.5 Stages of public participation utilization in 17 SEAs

Stage / SEA	early stage (scoping phase)	mid-stages	late stage (following draft SEA)
1			✓
2	✓		✓
3	✓		✓
4	✓	✓	✓
5	✓	✓	✓
6	✓		✓
7	✓		✓
8	✓	✓	✓
9	✓	✓	✓
10	✓	✓	✓
11	✓	✓	✓
12	✓	✓	✓
13	✓	✓	✓
14	✓	✓	✓
15	✓	✓	✓
16	✓		✓
17			✓

Level of influence. Influence of public participation often refers to the level of authority provided to participants in decision outcomes (Fung, 2006). In other words, if public participants input is reflected in outcomes of a decision-making process, then the participatory mechanisms employed in the decision-making process are highly influential. Findings from phase one of this research suggested that public participation related to food security assessment should be meaningful and highly influential in the SEAs processes. Higher levels of authority are typically associated with participatory formats that permit co-governance or coproduction. Lower levels of authority associated with participatory mechanisms include personal benefit (the lowest level of authority), communicative influence, followed by consultative (Fung, 2006). As with level of intensity, public participation formats also affect the level of influence. Public comment participation formats typically have little to no influence in decision outcomes; open houses and public hearings, likewise, are typically associated with low influence, all associated with either personal benefit or communicative influence levels of authority (Fung, 2006; National Research Council, 2008).

The overall influence of public consultation within the 17 SEAs was not explicitly evident. In general, however, based on what was included in the SEA reports, the influence of public participation was very limited (overall PTPS for criteria met in all SEAs was 37%).

Remarks such as: “comments received have been considered in this document” (SEA 1) and “comments were received, and those comments were taken into consideration during the composition of a draft SEA” (SEA 3) were common within the SEA documents, and often were all that was included regarding the influence or use of public consultation.

Four of the 17 SEAs received a score of zero for not meeting the recommendation criteria, because they either did not consider feedback from participatory exercises, or they were not transparent. These four SEAs contained almost no reference to public participation in their reports, and the influence of the participation exercises was not clear. Seven SEAs (SEA 3, 8, 9, 10, 11, 12 and 13) received a score of one for having minimally met the recommendation criteria, because they included slightly more reference to public consultation than the other four, albeit minimal influence was still observed. A few SEAs included references to public consultations or specific stakeholders throughout the documents, and when referring to specific topics. The SEAs that referenced public consultation or stakeholders frequently throughout the respective documents were SEAs 4, 5, 6, 14, 15 and 16; as such, the level of influence of public consultation was more evident in those six SEAs than the others, earning them a score of two for having somewhat met recommendation criteria. An example of the type of references made in the SEAs related to how public consultation was used is the following excerpt from SEA 5:

> During public consolations [sic] … in the Labrador Shelf SEA Area, fishers indicate area parceled for gas and oil exploration lie within crab fishing grounds (Parcel NL07-02_2). Fishers in Nain, Happy Valley-Goose Bay, Port Hope Simpson and Hopedale all raised concerns about the effect of exploration on crab fishing grounds.

The rare SEA was also very clear in the extent and manner to which public consultations influenced the SEA. For instance, SEA 14 included:

> The information and input gathered through the consultation process has informed and shaped the nature and focus of the SEA Update, by helping identify key information requirements and issues that require consideration in the analyses and report.
> Table 2.2 provides a general listing and summary of some of the main topics and themes which were raised throughout the consultation program, as well as a general indication of where these are addressed in the SEA Update Report. Again, a more detailed description of the consultation activities and inventory of the key questions and issues raised is provided in the Consultation Report (Appendix).

No SEA, however, seemed to integrate public participation beyond that of a basic advisory or consultative role, failing to meet the recommended level as specified by interview participants, in phase one. Higher levels of authority in decision making processes were, latently,

encouraged by the food security experts interviewed in phase one of this research, where it was suggested that all decisions made by practitioners should be highly informed by participants. However, higher levels of authority, such as those found in co-governance and direct authority, may not be necessary if public participation aim to address misunderstanding and misperception of the administrators (Fung, 2006). In other words, if the public participation format is high in intensity, and provides enough opportunities to influence practitioners—enough to penetrate preconceived ideas and perceptions of the administrators—than a more consultative level of authority in the participatory process may be sufficient. Nevertheless, the level of intensity alongside the level of influence observed in the SEAs did not align with the recommendations established in phase one; therefore, no SEA analyzed for this research fully met the recommended criteria for public participation level of influence.

Integration of vulnerable populations. Populations more vulnerable to food insecurity in a regional context include those that would be most affected by impacts to the regional food system as well as those simply more vulnerable to food insecurity—as was emphasized by interviewees in phase one. Indigenous peoples would be a subsect of the population that demand particular focus in public participation exercises, especially within a Canadian food security-considerate SEA process, due to both their heightened vulnerability to food insecurity and their typical reliance on their respective regional food systems (Kirkpatrick & Tarasuk, 2008; Kuhnlein & Receveur, 1996).

Findings from phase one suggested that engaging with vulnerable populations was critical for effective food security assessment. Literature, likewise, suggests that representation of those most likely affected, within participation processes, is necessary for successful public participation (National Research Council, 2008). Integration of vulnerable populations in participatory exercises was observed in 16 of the 17 SEAs (SEA 1 being the exception). All SEAs but SEA 1 therefore met the recommendation criterion minimally or somewhat. SEAs 5 and 14 obtained score of two for having somewhat met the recommendation criterion, the remaining eleven obtained a score of one for having rarely met the criterion. Overall, however, the level of integration was limited.

Express engagement with vulnerable populations in participatory processes within the SEAs was, generally, minimal. Without an explicit investigation of the regional food system, the specific populations that would be particularly reliant on the regional food system, and therefore

vulnerable to impacts, was unavailable in all SEAs. Engagement with those populations typically vulnerable to food insecurity was, likewise, limited. No SEA included an investigation into community poverty, reliance on welfare, single motherhood, or home ownership, and therefore no effort to engage with those that fall into those heightened vulnerability categories was made.

Most of the SEAs included some form of Indigenous engagement (14 of 17) but the majority passively integrated Indigenous groups or interest groups within a single stakeholder engagement process, or solely within early and late stages – opting to use their input through the process, but not engage with them throughout (12 of 17: SEA 3, 4, 7, 8, 9, 10, 11, 12, 13, 15, 16 and 17). Furthermore, Indigenous engagement was not discussed within those 12 SEAs as an explicit endeavor. Only two SEAs were explicit in their intention to engage with Indigenous populations. SEAs 5 and 14 explicitly outlined and highlighted Indigenous engagement; SEA 5, in particular, was extensive in their engagement of Indigenous voices: including rigorous TK collection from Indigenous groups, which took the form of several one-on-one interviews, earning its greater classification for intensity, influence and timing as well.

Collection of TK was noted as important to an SEA considerate of food security, when applicable, and is, likewise, included in CEAA's guidelines (CEAA, 2008). SEA 5 was the only SEA to incorporate TK in any meaningful way (Appendix K includes a table showing word count totals for "traditional knowledge", "TK", "traditional ecological knowledge" and "TEK" (traditional ecological knowledge) within the 17 SEA documents). Although inclusion of TK collection influenced the classification and scoring of the SEAs integration of public participation, TK is not generally considered a traditional form of public participation, as it was noted previously in chapter four (CEAA, 2008). Nevertheless, within the SEAs analyzed for this research, and to some extent within the interviews as well, TK was associated with public engagement and is therefore integrated into this section. SEA 5, additionally, applied mechanisms traditionally used for intensive public participation processes in its collection of TK, such as meetings with TK holders and interviews. The importance of TK in other SEA regions was not a topic discussed in the SEAs. It is possible that TK was simply not significant to communities within the assessment region. Regardless, its inclusion in the SEAs seemed to play a role in their consideration for vulnerable populations.

Population groups that did garner significant attention in the SEAs, and that are potentially vulnerable to changes in the regional food system, are those involved in commercial

fisheries. All SEAs but one (SEA 1 being the exception) explicitly and purposefully integrated commercial fisheries into their participation processes. The level of vulnerability of fisheries groups compared to those vulnerable to food insecurity would be hard to discern from the information available in the SEAs; however, marginalization felt by visual and cultural minorities, as well as those that fall below the poverty line, is typically significant in regard to vulnerability. If those marginalized populations rely in any way on the regional food system, they will likely feel a larger brunt of impacts. A vast body of literature focused on environmental justice suggests that marginalized populations disproportionately feel the burden of environmental hazards and are more likely to experience lower environmental quality from the offset (Anguelovski, 2013; Downey & Hawkins, 2008; Schlosberg, 2007). Nevertheless, commercial fisheries groups would be important to include within an assessment of food security for a coastal region, as their reliance on the regional food system for livelihood, or otherwise, is presumably significant. The inclusion of additional vulnerable populations, however, is of notable importance to a SEA that integrates food security considerations and was strikingly limited in the SEAs analyzed for this research.

Overall integration of recommended ingredients for public participation. The public participation criteria recommended by interview participants in phase one were intended for a particular context: adequate food security consideration and assessment in RSEA. The National Research Council (2008) asserts that participatory forms are hugely variable, and that there is no specific form suitable for all purposes; context plays a key role in identifying the best integration and format of participation. Because food security was not an explicit consideration in any of the 17 SEAs, the public participation mechanisms employed may have been selected for, and more suitable to, the topics considered within each SEA.

The design and application of public participation processes in SEA remains a current research priority within the EA scholarly community, and specific recommendation are still being established in the literature to date (Rega & Baldizzone, 2015). What is acknowledged in EA literature, however, are guidelines for public participation in EA practice, supported by the IAIA, including that: affected and interested public should have an opportunity to understand and contribute to the assessment starting in early stages; public participation processes should be open, transparent and supportive of participants; considerate of the cultural and demographic context of participants; and inclusive of disadvantaged communities (Andre et al., 2006). Those

recommendations seem to align with recommendations made by food security experts in phase one, as well as with approaches regarded as contributing to successful public participation processes in decision-making, generally (National Research Council, 2008). If SEA was carried out in alignment with best practice, and food security was an explicit consideration in the SEAs, the recommendation criteria for adequate public participation would theoretically be met. However, the fact that the level of influence, integration of vulnerable populations and intensity and input opportunity of public participation scored so low in the 17 SEAs analyzed, overall, suggests that public participation in SEA practice, more generally than for its integration of food security as a consideration, may fall behind the expectations attached to SEA in theory. Literature investigating the manner to which public participation in SEA practice aligns with its theory and expectations, likewise, suggests this is a contemporary issue with SEA practice (see Rega & Baldizzone, 2015), and an area that is currently garnering scholarly attention. It is clear that improvements are still needed to bring SEA practice up to theoretical standards.

The document analysis findings suggest that public participation in SEA is improving and aligning more with recommended participation criteria for adequate consideration of food security in SEA somewhat over time. However, the improvement is not statistically significant[13], suggesting that public participation in SEA is not improving at a rate that is meaningful. Figure 5.3 shows the PTPS for public participation criteria met in the 17 SEAs per year of completion. Based on the trendline equation (y = 0.0065x - 12.535), public participation is improving at a rate of 0.65 percent per year, on average, in its integration of the recommended public participation ingredients for a food security-integrative SEA.

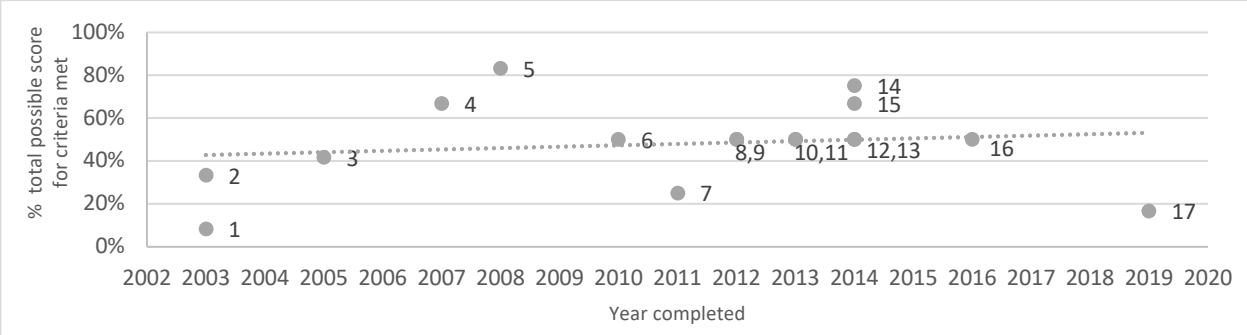

Figure 5.3 Percentages of total possible score for integrating public participation criteria in 17 SEAs per year of completion

[13] R Square = 0.022, F(1,16)=0.35, p=0.56

Notwithstanding the potential limitations of the analyzed SEAs in public participation, generally, the fact that public participation is incorporated, at least somewhat, in all the SEAs is reassuring as a foundation for public participation is established in SEA practice. Furthermore, there appears to be a connection between public participation and the consideration for food security, suggesting that when SEAs are more in line with their public participation standards, food security becomes a natural inclusion. The two highest scoring SEAs for recommended public participation criteria met were SEA 5 (with a PTPS of 83%) and SEA 14 (PTPS of 75%). These two SEAs distinguished themselves from the other 15 in their integration of Indigenous populations in participatory exercises, in their tremendous efforts involved in incorporating public participation in multiple stages of the SEA process and with multiple formats, in their transparent and open reporting of the public participation processes, and in the clear influence of participation exercises in the decision outcomes. These two best scoring SEAs for public participation, were also the two best scoring SEAs in their consideration of food security elements and dimensions, discussed above. Comparing the results of both PTPS for consideration of food security and the PTPS for criteria met for public participation in the 17 SEAs, likewise, shows this trend for all the analyzed SEAs (see Figure 5.4).

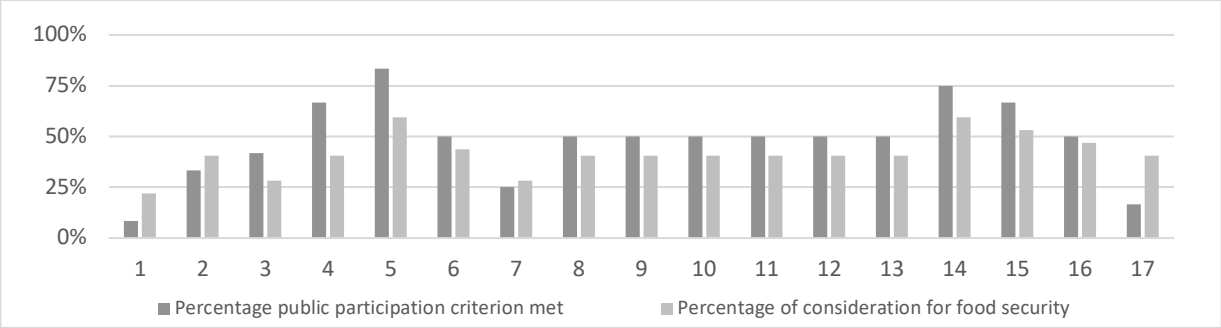

Figure 5.4 Comparison of the PTPS obtained by 17 SEAs for public participation criterion met and consideration for food security

One of the primary benefits of public participation expressed in SEA literature is that public interests and concerns are more explicitly addressed and reflected in SEA processes (Rega & Baldizzone, 2015). Therefore, the strong relationship between the consideration of food security and utilization of public participation[14] suggests that food security is an important concern for communities living within an SEA impact area. In other words, the importance of

[14] Pearson correlation results indicated that among the 17 SEAs, the percentage of food security elements met and percentage of public participation criteria met were positively correlated, $r(15)=0.82$, $t=5.57$, $p<.001$.

food security seems to be at least somewhat illuminated when the public is more extensively and meaningfully involved, as appears to be the case with the two highest scoring SEAs (SEAs 5 and 14). This finding is not surprising given the high prevalence of food insecurity in Canada and across the globe (FAO et al., 2020), but it does underscore the importance of public participation in SEA to reflect public interest, as well as the seeming importance of considering food security in SEA processes to the communities potentially impacted.

With respect to a primary outcome of this research, a conceptual framework to better consider food security in RSEA, the positive relationship between the level of consideration for food security and the level of integration of participatory elements suited to food security assessment is promising. The strong positive correlation suggests that greater integration of recommended public participation in SEA may intrinsically shift the process toward stronger integration of food security in SEA processes, or alternatively that application of a conceptual framework for food security assessment in RSEA may result in better integration of public participation.

5.2.2 System Analysis

A fundamental characteristic of SEA is to find connections within the environment to identify impacts; therefore, system analysis is at the heart of SEA. For the consideration of food security in RSEA, a system analysis was emphasized by interview participants so that interconnections in the environment can be identified, and any potential impact can be traced through the system to identify how and where it may be felt. The notion that a system or pathways analysis is characteristic of SEA is supported within literature. In a review of SEA methodologies, for instance, Finnveden et al. (2003) examine a number of analytical approaches common within SEA practice,[15] all of which utilize a system approach in their analysis, where an examination of a system and its interactions is conducted (Arnold & Wade, 2015). Congruently, "systematic assessment" is a defining principle of RSEA (CCME, 2009). The Canadian Council of Ministers of the Environment defines RSEA as "a process designed to systematically assess the potential environmental effects, including cumulative effects, of alternative strategic initiatives, policies, plans, or programs for a particular region" (2009, p. 6).

[15] Methods examined included: forecast and future studies, life cycle assessment, environmentally extended input/output analysis, risk assessment, impact pathway approach, ecological impact assessment, multiple attribute analysis, environmental objectives, economic valuation, surveys, and valuation methods.

A system or pathways approach was, likewise, observed in all 17 SEAs analyzed. All SEAs included some characterization of the environment as it pertained to their selected VECs; after that, an assessment of potential effects of potential incoming development was carried out, followed by an impact assessment on various components within the environmental system. This pathways approach was articulated in a number of SEAs; for example, SEA 14 stated: "There is a need to consider the area in a holistic manner, including interrelationships between species and the human communities and activities which depend on this marine environment". Some SEAs were more extensive in their assessments than others, discussing and connecting more elements. SEAs 14 and 15, for instance, adopted a particularly thorough approach to their analysis in which a "multi-species approach" was employed to expand their assessment beyond species directly pertinent to a selected VEC (a factor that influenced the level of consideration for food security elements as well, discussed above). All 17 SEAs, however, connected elements in the environmental system to identify system components, stressors and trends, and ultimately potential impacts. All the SEAs, additionally, incorporated a vast variety of indicators for measuring and understanding any given concern, and its potential risk and impact.

Even the SEA that performed the worst against prior analysis criteria for this research (SEA 1) carried out a systems approach in its analysis. This SEA, for example, characterized the distinct ecosystems within the region (including: size, water temperatures, water flows, occurrence of important biological events (i.e. spawning), topography, wave and tidal patterns, geological features, to name a few), followed by a characterization of a wide variety of species that occur within the region and their lifecycle requirements (including: habitat, food sources, migration patterns, mating habits, predators and so on—with detailed descriptions for select, important species (like that of commercially important fisheries resources)). Following an overview of potential effects of petroleum development, the potential interactions with various environmental components was then analyzed. This general approach was employed in all 17 SEAs.

Although food security was not included in the SEAs, and therefore a food security pathway was not established in any of the SEAs, a simple application of an SEA process seems to align with the systems or pathways analytical approach recommendation put forward by food security experts, in phase one. This aligns, too, with the recommendation for employment of a suite of indicators. It is therefore surmised that adequate consideration for food security within a

SEA, in which all food security dimensions and elements are considered, would naturally apply a system analysis to the assessment of regional food security.

5.3 Summary of SEA integration of food security considerations and procedural requirements

Some general deficiencies in SEA practice were observed in the analysis of the 17 Canadian SEAs. Following the document analysis, based on EA literature on SEA effectiveness, it was evident that substantive as well as procedural deficiencies persist in Canadian SEA practice. Substantive issues, related to the extent that the SEAs are carrying out their objective of sustainable development, were identified in their limited consideration for health, culture, more general socio-economic issues and, more specifically, food security. Procedural issues were observed in the limitations associated with public participation mechanisms, namely transparency issues and engaging vulnerable populations. More work is clearly needed to bring SEA practice up to its own performance standards. Those findings related to integration of health, socio-economic issues and public participation in SEA are not particularly novel, as limitations in health integration, advancement of sustainable development, and public participation are well known in EA literature (see Douglas et al., 2011; T. Fischer, 2014; T. Fischer & Onyango, 2012; Gauthier et al., 2011; Rega & Baldizzone, 2015; White & Noble, 2013). Consideration for food security in EA, however, is not something that has been studied much to date but would enhance SEA effectiveness both procedurally and substantively because it is a determinant to both human health and sustainability, and its consideration would align with SEA performance criteria as well as its sustainability objectives.

It is clear there remains to be underlying procedural and substantive issues that need to be addressed with Canadian SEA practice, and a number shortcomings related to the consideration food security were identified in the SEA document analysis. Based on the findings of the document analysis, significant variation was observed among the SEAs in their consideration for food security and in their integration of recommended public participation procedural components for effective food security assessment, an exception being in their integration of a systems or pathways analysis, in which they all met the respective recommended procedural approach. Nevertheless, substantial capacity for improvement in the integration of food security in SEA was identified. On the other hand, however, several promising findings emerged from the

document analysis as well. First, the analytical approach recommended for effective food security assessment in RSEA is foundational to SEA. Therefore, the mere SEA process is suited to gather and synthesize food security data to effectively address threats and impacts. Second, it is promising that certain important components of food security were considered, at least in part, in all the SEAs, suggesting that a basis for the integration of food security as a consideration in RSEA may already be established: some food security issues are already being considered and the procedural approach utilized by SEA seems largely suitable to food security assessment. Third, those SEAs that best considered food security also best integrated public participatory mechanisms recommended for the assessment of food security, suggesting that a connection between the consideration for food security and the participatory mechanisms utilized in SEA may be inherent, or otherwise correlated. Finally, the analysis of SEA documents showcased the aspects and conditions that underlie stronger consideration for food security within the SEAs, as well as those aspects to which particular attention is needed to adequately consider food security in RSEA processes. Informed by the findings of both research phases, a conceptual framework was developed for adequate and effective integration of food security in RSEA that is supported by food security experts and grounded in SEA practice.

5.4 Framework for incorporating food security in RSEA

The conceptual framework resulting from this research is intended as a guide for SEA practitioners who are interested in including food security as a consideration in RSEA or broad-scale SEA. The framework integrates findings of phase one, which produced key ingredients and procedural components for adequate incorporation of food security in RSEA, and phase two, which showcased strengths and limitations of current SEA practice in the incorporation of food security consideration requirements as well as opportunities for its effective integration. Figure 5.5 presents the framework for how to effectively integrate food security in RSEA, focusing on aspects that are critical to its adequate consideration, or that are currently deficient.

The framework incorporates stages typical of a generic RSEA framework and shows where various food security considerations, as well as certain procedural components (i.e., public participation), would best be integrated. The white boxes on the left half of the framework are aligned with a common CEAA (2009) RSEA framework. Specific aspects of food security assessment within the white boxes highlight what considerations and processes align within each

RSEA stage. The dark shaded boxes on the right side of the framework are essential components of food security assessment, identified in phase one, with arrows identifying where those essential components are best integrated or considered.

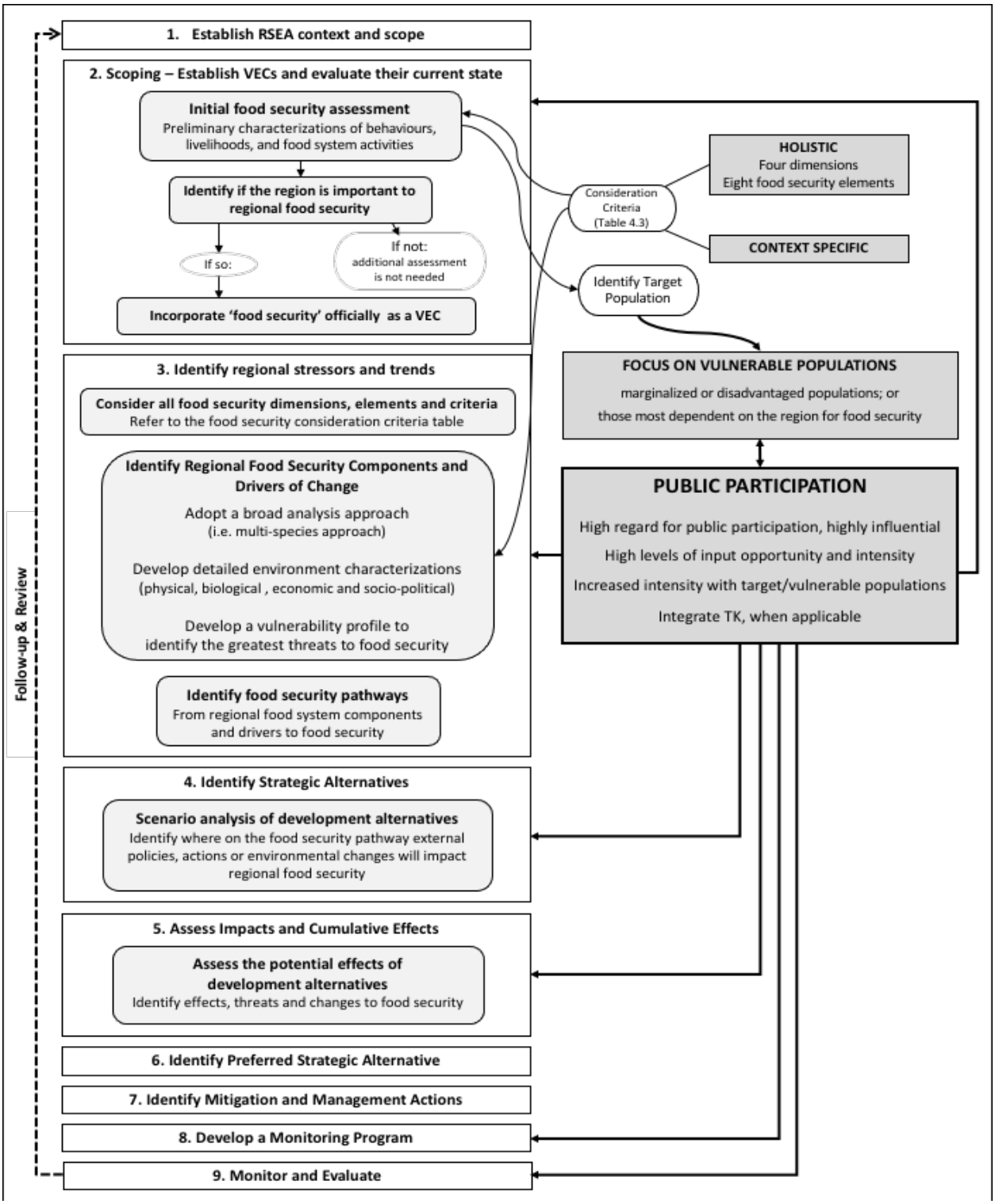

Figure 5.5 Framework for integrating food security into RSEA

In the early stages, following a generic RSEA framework, it is important to conduct an initial assessment of the regional food system that examines how the region plays a role in food security of the regional populations, to determine if a full food security impact assessment should be carried out. Within this initial consideration, it is essential to focus on multiple factors such as: regional food production; the food economy; food consumption; behaviours surrounding regional food; livelihood outcomes of the regional food system; culturally and socially important food, food acquisition methods and practices surrounding food; historical importance of regional food; social opportunities that aid in regional food production, acquisition or consumption; and social barriers, social discrimination and historical but lasting social conflict (as is highlighted within the consideration criteria table presented in chapter 4).

If it is determined that the region is important to the food security of regional populations, 'food security' should be integrated as a VEC, and the remaining shaded boxes within the presented framework are relevant to the rest of the RSEA process. Specifically, when considering food security, a broad analysis approach should be adopted, like that of a multi-species approach, to broaden the scope of the 'system' and to include any potentially pertinent details that might be otherwise missed. The consideration of the food security components, elements and dimensions would be best integrated within a broad scale analysis. Specific food security considerations, elements and dimensions to be integrated within a food security assessment in RSEA are detailed within the consideration criteria table (Table 4.2). A holistic understanding of food security—such that all eight food security elements are considered—is paramount for effective food security consideration.

Public participation is a priority within the framework and should be utilized throughout the RSEA process, as demonstrated with several arrows pointing to different stages of RSEA. Special effort should be made to include and focus on populations and community members that are particularly vulnerable to food insecurity, for public participation processes as well as for the broader food security assessment. Public participation processes should also adopt high intensity public participation mechanisms to facilitate data collection. Traditional knowledge should be collected throughout the same stages as public participation, if Indigenous communities within the region feel there is relevant TK to consider.

Within the RSEA, characterizations of the physical, biological, socio-economic and socio-political environments should be included, containing the details identified as important to

the food security assessment in a regional context that are pertinent to the specific regional food security system (details to consider are within the consideration criteria Table 4.2). For instance, the RSEA should include characterizations of the following: the regional economy, the health situation, general community characteristics, the agroecosystem, institutional supports or barriers, social histories, economic history, and so on. In congruence with the characterizations, a vulnerability profile should also be developed that identifies the greatest threats to regional food security and establishes the basis for how impacts may be felt.

Following characterizations, food security pathways can then formally be established. Food security pathways establish connections between all relevant components of the food system that ultimately connect to food security, including interactions, drivers of change, and feedbacks. Pathways help clarify aspects of the food system that may be most at risk, and where interactions from development scenarios would impact food security. Ericksen's (2008) integrated food systems framework provides a useful resource for making sense of food system pathways, it's drivers and interactions, and therefore may be particularly insightful for the RSEA stage where impacts are explicitly assessed (stage 5); however, consideration of interactions and drivers of change is typical to RSEA and identification of those pathway components may already be somewhat inherent to the process, as long as food security is considered holistically, as proposed. Nonetheless, the integrated food system's framework may be a useful supplement to the larger conceptual framework for assessing food security in RSEA. Understanding the food security pathways ensures that the impact assessment stage of RSEA is well situated to consider potential effects on all aspects of regional food security.

The framework presented here is considerate of the complex and multi-factorial nature of food security and is intended to encourage and facilitate effective consideration of a complex but important social issue in RSEA that is currently poorly considered. Utilization of the framework is intended to improve SEA effectiveness, by enhancing consideration for the social environment, for health, and for sustainable development.

CHAPTER 6

CONCLUSION

This research has explored how food security may be effectively incorporated in RSEA processes when planning for natural resources developments in Canada. The overarching goal was to contribute to global efforts to reduce food insecurity prevalence and enhance human health by exploring how food security may be considered within a highly utilized and respected Canadian environmental assessment process. Health and food security intersect with sustainability, a principal development goal in Canada and countries around the globe (United Nations, 2015b). Health and food security should, therefore, be imperative considerations in RSEA, particularly when potential incoming development puts health and food security at risk of diminishing—a common outcome of natural resources extraction development (Ko & Day, 2004; O'Rourke & Connolly, 2003). As it directly informs decision-making and governance related to natural resources extraction development, RSEA is well positioned to address food security issues arising from respective development programs. A commonly stated goal in environmental assessment processes, including RSEA, is sustainable development. To date, however, food security in RSEA is a topic not previously explored in academia. The purpose of this research was, therefore, to explore how food security considerations may be incorporated into RSEA for natural resources extraction development in a manner that is adequate, effective, and relevant. The main products of this thesis are: (i) a practice review of SEAs conducted for offshore petroleum development in Canada, from the perspective of adequately considering food security; and (ii) a conceptual framework intended to guide SEA/RSEA practitioners when integrating food security in their impact evaluation processes. This chapter provides conclusions with respect to each of the research objectives identified in Chapter 1. It also examines implications of the research findings and suggested next steps for future research.

6.1 Major conclusions with respect to the research objectives

6.1.1 Objective I – Identify food security assessment criteria and requirements for RSEA

Phase one qualitative thematic analysis of food security expert knowledge was conducted to identify key consideration criteria and procedural requirements for effective food security

assessment that align with the demands and constraints characterized by RSEA processes. Best practice in food security assessment was not directly transferable to RSEA frameworks, due to: (i) limited research on regional food security assessment, at the scale that is relevant to regional environmental management planning—not bound by political boundaries but by ecological boundaries; and (ii) limited research on food security assessment for the purpose of addressing impacts or threats, and no research on the specific application to RSEA.

Interviews with food security experts, representing a global view from the United Kingdom, the United States, Africa, and Canada, were successful in harnessing knowledge and applying it to a topic not previously explored. Strong recommendations emerged related to the specific application of food security assessment at a regional scale typical of RSEA and for the purpose of assessing impacts in connection to industrial development. Specifically, clear lines of consensus among the food security experts arose with respect to what must be considered, procedural details, timing, and analytical approach, thus addressing the first research objective. Based on this evidence, the main conclusions that can be drawn from this phase of the research are:

1. Food security assessment cannot be applied in a piecemeal fashion. It must include holistic and comprehensive consideration of all four food security dimensions: availability, access, utilization and stability—in a systematic and context-specific manner.
2. Communities should be profiled in early stages of the assessment to identify livelihood strategies, behaviours, cultural histories, social conflict, and political influences surrounding food to characterize the regional food system (current and historical) and define its importance to food security, as well as define vulnerability.
3. Vulnerable populations should be the focus of food security assessment and engagement exercises as they are the most likely to experience food insecurity and impacts to food security.
4. Meaningful and influential public participation is one of the most important components of effective food security assessment, because a food security situation can only be understood by those people experiencing it. Thus, public participation should highly embraced and utilized throughout the RSEA process.

5. The most fitting analytical approach for food security in RSEA is a system analysis. A system analysis is designed to examine a system, its pathways and its interactions. This analytical approach can, thus, provide a holistic picture of a regional food security situation such that threats and potential impacts to a region's food system can be contextualized.

Results from the interviews were used to inform the SEA document analysis carried out in the second phase of research. The major findings of the interviews were also built into the conceptual framework that subsequently emerged.

6.1.2 Objective II – Explore how food security is considered in Canadian SEA practice

The qualitative document analysis of Canadian offshore petroleum development SEAs provided information about how food security is currently considered in SEA practice within this natural resource extraction sector, thereby addressing the second research objective. Gauging the level and manner of consideration for food security in SEA practice and gathering insights about current SEA approaches and methodologies helped inform the conceptual framework presented in Chapter 5.

Results of the document analysis led to several important conclusions. First, there is a lack of explicit consideration for food security in Canadian SEA practice and thus, a substantial scope for improvement. Many of the areas lacking in consideration align with gaps previously pointed out in SEA literature. For instance: consideration for the socio-economic environment lags behind considerations related to the biophysical environment. This does not help to advance sustainable development, which is a primary goal of SEA.

Second, SEA is not meeting good practice recommendations and guidelines for public participation. Effective public consultation is a must to address food security. Helping the people in a region to become food secure – and evaluating impacts on factors affecting food security - can only be done in partnership with communities affected.

Third, the importance of public participation as a driver to the consideration of food security was observed by the strong positive relationship between the utilization of public participation and the consideration of food security. The SEAs that best considered food security also best integrated public participatory mechanisms recommended by both food security experts and SEA scholars. Greater integration of recommended public participation in SEA therefore

seems to intrinsically shift the process toward stronger integration of food security in SEA processes, suggesting that food security is inherently a topic of importance to communities being assessed.

Finally, any consideration for food security in the SEAs was almost exclusively related to selected VECs (i.e., commercial fisheries). The finding showcased the important role of VECs in guiding the SEAs, but also showcased a tendency to circumscribe the SEAs and their applicability to broad development and governance goals. Consideration for commercial fisheries, for instance, was largely aimed at industry wellbeing, and not on social livelihood, nourishment or other fisheries outcomes. The tendency for SEAs to focus narrowly on the VECs, in correspondence with a tendency to focus on the biophysical environment suggests that a clearly defined VEC is advantageous, particularly to those issues that have some linkage to the social environment. That said, a number of encouraging findings suggest that the integration of food security into RSEA is a realistic and practicable goal. At least some aspects of food security were included in all SEAs analyzed (albeit to varying extents). The analytical approach characteristic of SEA aligns with the analytical approach recommended by food security experts, such that a system approach to analysis was the dominant analytical approach utilized in the SEAs. As well, VECs examined in the SEAs were extensively analyzed, suggesting that a well-defined food security focused VEC would also be thoroughly analyzed, should one be included.

6.1.3 Objective III – Develop a framework for effective integration of food security in RSEA

The final objective of this research was to develop a conceptual framework to help practitioners incorporate food security considerations in RSEA processes. In the offshore petroleum industry on Canada's east coast, based on the sample of SEAs reviewed, it is clear only some aspects of food security are being considered, and indirectly. This conclusion suggests that food security is likely not being considered in the fulsome manner suggested by food security experts in this industry elsewhere in Canada and abroad. Additionally, the evidence shows that cultural and social aspects of food security are particularly poorly considered and will demand greater attention to achieve good practice RSEA. The framework provides guidance in this manner, highlighting eight core elements of food security consideration, each with specific criteria to be examined. Applying the framework will hopefully reduce the chance that important food security considerations are missed in future RSEA practice. The framework also shows how

to define the importance of a food security assessment in a particular SEA application, which depends on baseline data and environmental characterizations. In this regard, a comprehensive food security assessment may not be required for a RSEA process if the region is not important to food security—some baseline information is nonetheless needed to clarify its importance. The framework also emphasizes public participation: it should be incorporated in multiple stages of the SEA process, focused on vulnerable populations, be highly influential, and should adopt meaningful forms of participation.

6.2 Implications of the Research for Improved SEA Practice

Application of the proposed conceptual framework can potentially stymie worsening food insecurity (the current trajectory in Canada), and enhance food security for communities affected by the onset of industrial regional resource development. It can also advance the currently limited food security consideration and agendas in Canadian environmental management and governance. At the same time, it can improve Canadian SEA effectiveness by better considering health (a mandated SEA consideration), better aligning SEA to its purpose of advancing sustainable development, and better meeting recommended public participation standards. It is acknowledged that current procedural and substantive shortcomings with current SEA practice challenge the seamless integration of food security into RSEA; however, findings emerging from this thesis research suggest that the framework can improve SEA practice simply by being applied.

To date, integration of health considerations in SEA has proved to be challenging. There is lack of good baseline data on health; health is being defined too broadly, resulting in a prioritization of biophysical health determinants; and there is limited integration of healthcare professionals in SEA processes (Bond et al., 2013; T. Fischer, 2013; T. Fischer et al., 2010). The framework developed in this study may begin to address all three of these shortcomings. First, it emphasizes collection of baseline data to characterize a variety of concerns within the socio-economic, socio-political, biological, and physical environments. It also provides a list of health-related criteria to direct an assessment (such as integration of a community health profile including the prevalence of somatic disease, or a profile of regional food nutrition, for instance), taking some of the guesswork out of what to include in the SEA. Second, it emphasizes consideration of issues beyond biophysical to ensure that social and behavioural determinants of

health (such as social supports, social norms, poverty, or diet, for instance) are also included. Third, many of the criteria included in the framework naturally implicate healthcare professionals in the SEA process: they are needed to provide some of the data and insight about the local/regional population(s).

More broadly speaking, adequate consideration of social components in SEA is generally lacking—biophysical components of the environment are typically prioritized (T. Fischer & Gazzola, 2006; Lobos & Partidario, 2014). Social components included in the framework include consideration of the following: food consumption patterns and diets; cultural keystone food species and details of their importance; socially and culturally important harvest locations and methods; current and historic social conflict or supports that impede or promote food security; and institutional emergency supports, to name a few. Application of the framework will help strengthen SEA as a tool to support sustainable regional development.

SEA practice does not always meet recommended standards or procedures for public participation (Aschemann et al., 2016; Rega & Baldizzone, 2015). Both SEA and food security assessment depend on strong public engagement to be effective. The proposed framework recommends integration of respectful and meaningful public engagement with vulnerable populations throughout the SEA process. Therefore, application of the framework can help to improve SEA's procedural effectiveness. Additionally, the strong correlation found between the consideration for food security elements and the integration of recommended public participation mechanisms during the SEA document analysis suggests a relationship between the level of consideration for food security and the incorporation of recommended public participation criteria.

6.3 Future Research and Final Remarks

The proposed framework has not been used to guide an RSEA process and therefore not been tested. Application of the framework may be hindered by a variety of challenges that beset SEA. Challenges associated with conducting effective SEA and RSEA that may affect efforts to adequately integrate food security include: (i) institutional challenges (i.e., limited funding, limited capacity, lack of leadership, or lack of clarity in SEA direction); and (ii) persistent disciplinary disconnection (i.e., limited communication, skepticism and distrust, data ownership concerns) (Olagunju & Gunn, 2016). Not yet established are the most pressing challenges to

successful application of the framework. An immediate next step would be application of the framework, and subsequent analysis of its primary obstacles as well as the strengths and shortcomings of the framework itself. Canada's colonial history surely impacts all impact assessment processes. Regional SEA may contain colonial overtures that may be a limitation to application of the proposed framework. The framework and its related consideration criteria represent an ideal scenario. It is recognized that in practice food security assessment may not be able to reflect everything in the framework due to realities and constraints of industry and government. Regional SEAs are negotiated processes depending on time, funding, willingness of participation, external research available, and so on. Therefore, if and how the proposed framework can be implemented remains to be seen.

This research is just the start of the conversation about how food security fits into SEA practice; a conversation barely begun, yet critical to sustainable development agendas. More research is needed to determine best practices to address food security in regional SEA, in across various development sectors, countries, and regional and local contexts. Whereas this thesis focused on offshore petroleum development and the marine food system, other study contexts may include additional natural resource extraction development (such as mining, forestry, or surface drilling), other land use management (such as urban expansion or transportation expansion, for instance), different regulatory regimes, and food systems may be agricultural-based, reliant on a forest ecosystem, or otherwise.

In the Canadian context, governance of natural resources development projects is complex. The geographical landscape of Canada is spatially significant, with a diversity of environments, natural resources, peoples and cultures. Accordingly, legislative frameworks governing natural resources are regionally regulated, which influence how impact assessments are carried out (Elvin & Fraser, 2012). Indigenous involvement in development decisions in some regions is well developed—the Nunavut Impact Review Board (NIRB) and Yukon's Environmental Impact Review Board (IERB), for example, are co-management arrangements between Indigenous populations and the federal government responsible for overseeing impact assessment processes—whereas in other parts of the country there are limited considerations for Indigenous rights (Westman & Joly, 2019). Indigenous involvement could affect how food is considered or assessed. Every country and every region will have a unique political, social and economic backdrop. This is a generic framework that can hopefully be adapted or fit for purpose

in a context of application. Although the criteria contained in the conceptual framework were derived from global food security experts and literature, these criteria were largely interpreted for one application context: more research is needed to adapt and adjust the framework to other regional contexts, other countries and other sectors, and to confirm its broader applicability. That said, the proposed framework is an important tool that can be applied to protect, maintain or improve the health and welfare of vulnerable populations in the course of natural resource extraction in a regional context, and may prove highly useful in the assessment of future development programmes in Canada and abroad.

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APPENDIX A

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Supervisor: **Dr. Jill Blakley**

Title: Incorporating food security in regional strategic environmental assessment

Context: This research addresses how food security can be enhanced for communities affected by the onset of intense regional development. Natural resource development projects can pose a serious threat to a region's food security, yet consideration for food security in environmental assessment is limited. Strategic environmental assessment (SEA) is a type of environmental assessment used to determine the potential impacts of human development projects, plans and programmes in Canada and many other countries around the world. Strategic environmental assessment has gained substantial recognition and credibility as a process to aid regional planning efforts, influence decision-making and encourage sustainable development. Although the process is somewhat flexible and permits some methodological variation, best practice criteria have been established by the International Association for Impact Assessment and the Canadian Environmental Assessment Agency. Health is one consideration that receives priority within SEA doctrines, i.e., its adequate consideration is said to be important for effective and sustainability-driven SEA practice. yet its consideration for health appears to be scant in the SEA literature. Food security is fundamental to human health and is impacted by industrial development, but is, likewise, given little to no attention in environmental assessment discourse. Regional strategic environmental assessment is a version of SEA that evaluates proposed development across a broad geographical area and is the preferred form for analyzing natural resource development programs. This research proceeds under the assumption that regional SEA is best suited to consider food security in environmental assessment processes because food systems characteristically extend beyond a local scale, and the cumulative effects of multiple development projects are best observed and understood at a broader scale. The integration of food security considerations in regional SEA would not only enhance the food security of communities affected by resource development, but also improve the effectiveness of the impact assessment process due to the inherent connection of food security to both health and sustainability.

Purpose: To explore how food security considerations may be effectively integrated in regional SEA processes conducted for natural resource development programs.

Objectives:
1. Identify food security indicators and assessment approaches that can be integrated within established regional SEA frameworks and methods;
2. Determine the extent to which food security has been considered in Canadian SEA practice to date; and
3. Develop a conceptual framework to address food security more effectively in regional SEA processes

Methods:
1. *Semi-structured interviews with food security experts* selected from an international pool of academics that are contributing to the development and review of food security assessment and analysis and who have published on the topic in academic journals. Preference will be given to those who have published on regional food security—defined in terms consistent with a scale commonly used for evaluating natural resource development plans (*i.e., direct ecological and human impact region*). A snowball sampling design will then be used to identify other individuals known to be academic leaders in the field. Approximately eight to twelve interviews will be conducted to ask about which food security indicators and approaches would be most appropriate for assessing food security in context of planning for resources development.
2. *Document analysis of Canadian SEA reports*: to identify to what extent and in what ways food security is currently addressed in Canadian SEA practice and suggest means to improve practice based on interview results.

Outcomes: The product of this research will be a conceptual framework that will identify opportunities and approaches for incorporating food security effectively in regional SEA. The conceptual framework is anticipated to be a valuable tool for regional SEA practitioners in the future, and to ultimately contribute to the development of more sustainable and healthy communities.

APPENDIX B

Food Security Experts: Interview Schedule

Definitions used in this research:

Food security — a situation in which "all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO, 1996)

Region — A geographical region in which direct ecological and human impact is likely to occur as a result of natural resource extraction development *(not necessarily defined by political boundaries)*

Part I: Fundamentals of assessing food security:

1. In your opinion, what are the key considerations when assessing or analyzing food security?
2. What are some primary constraints and challenges with assessing or analyzing food security?

Part II: Assessing and analyzing food security in a regional context:

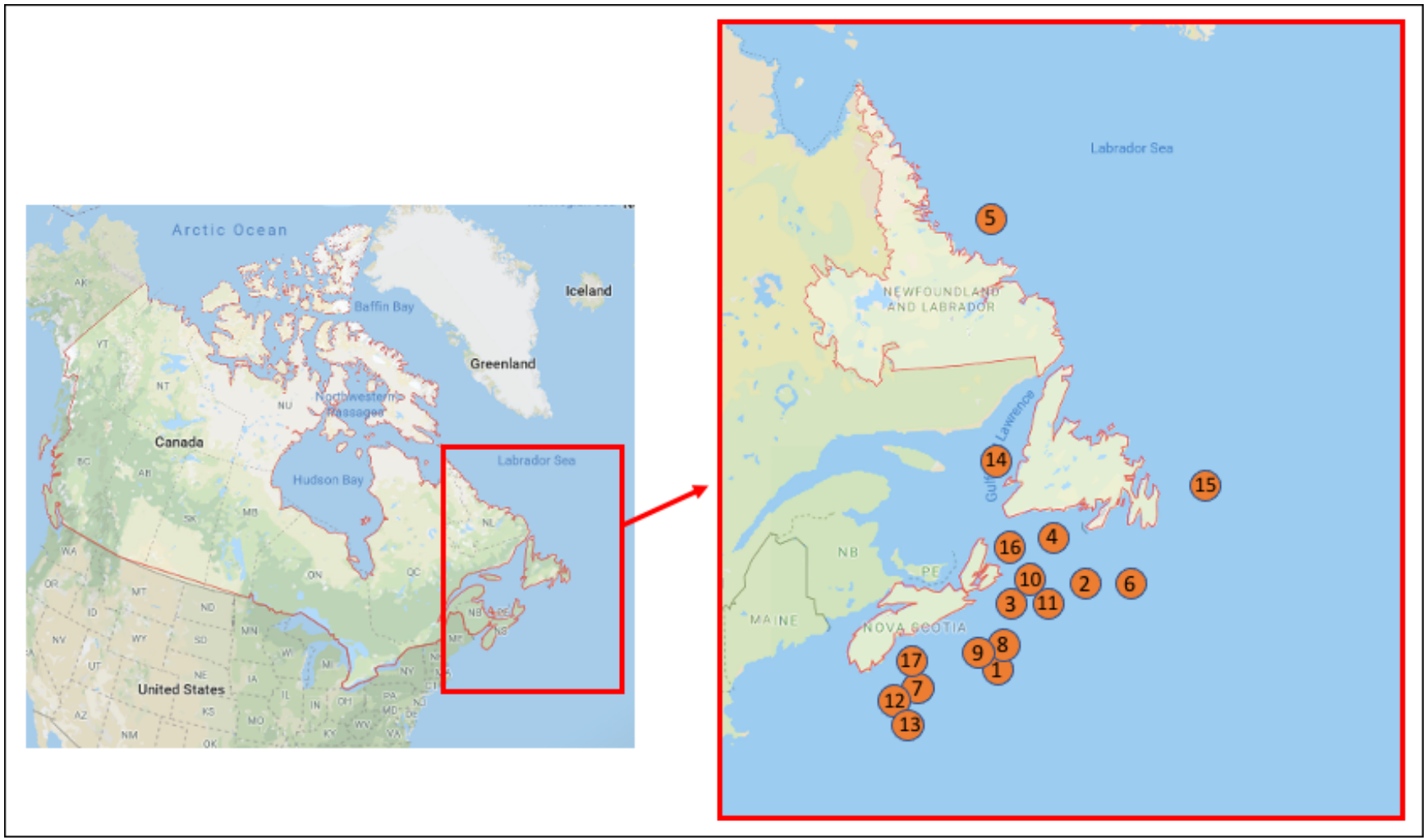
3. Is food security assessment or analysis different at a regional scale than at other scales? How?
4. Many people affected by resource development live in remote and rural regions, are Indigenous, and in Canada, often rely on country food. How should food security assessment be adapted, or focused, to fit this context?

Part III: Food security assessment and analysis when evaluating natural resource development:

1. What are the specific considerations or concerns when selecting food security indicators for an assessment of impacts (or threats) posed by policies, plans or development as opposed to an assessment conducted for the intent purpose of developing food security intervention strategies?
2. How might food security be given adequate consideration when evaluating natural resource development? *(e.g., offshore oil development)*
3. What issues/valued components are key to food security in the context of regional resource development?
4. What kinds of data/information would need to be collected to understand the state of food security, and past trends? How is the baseline of food security assessed?
5. How are impacts to food security assessed? Can impacts to food security be assessed in a strategic manner, before development takes place?
6. What is the role of TEK (traditional ecological knowledge) in food security assessment?
7. Participation in the assessment – who should participate to ensure food security is adequately assessed and analyzed? How much of this should be self-determined by those affected, and how much by outside scientists?
8. How do we know when food security is worsening or improving at a regional scale?
9. Thresholds and limits to change – how much change is too much, and how can this be determined?
10. What strategic actions can be made to enhance food security in a region facing intense resource development? (management, policy, intervention, etc.)
11. In what ways do you think food security assessment needs to be strengthened in order for it to be better integrated in strategic planning processes?

APPENDIX C

Approximate location of the study region for each of the 17 SEAs analyzed



APPENDIX D

SEA Document Analysis Framework

Purpose of and approach to content analysis:

- To explore the extent to which food security is currently considered in Canadian SEA reports
- To find *sections, passages, and statements* in the reports that may have some link to food security.
- Once found, I will search for both direct (manifest) indication and indirect (latent) connection to food security within the text
- Subsequent coding and categorization will be based on themes related to the dimensions of food, as well as on themes identified in literature and interviews re: food security assessment approaches
- Categorized data will then be analyzed against magnitude scales to quantify the level and manner of consideration

Four dimensions of food security to be primary coding themes:

- availability
- access
- utilization (nutritious, culturally appropriate, etc.)
- stability (resiliency, sustainable access/availability/utilization)

Additional themes:

- best practices in food security assessment of impacts (public consultation, pathways/food system analysis

General search terms:

- Food security
- Food
- Feed/Fed
- Eat*
- Agri*
- Aqua*
- Marine

Search terms related to *availability*:

- Sustenance
- Subsistence
- Availab*
- Sufficient and sufficien*
- Supply
- Production
- Stock (stock level and trade)
- Trade
- Demand

Search terms related to *access*:

- Livelihood
- Access
- Attainment
- Cost
- Price
- Trade
- Poor
- Poverty
- Impoverish*
- Income
- Hunger
- Expenditure
- Market

Search terms related to *stability*:

- Stability
- Sustainab*
- Develop*
- Risk
- Resilien*
- Security
- Degradation (degrad*)
- Erosion

Search terms related to *utilization*:

- Nutri*
- Diet
- Nourish
- Cultur*
- Tradition
- Health
- Diversity (and biodiversity)
- Utilization
- Distribution *
- Wild
- Country
- Fish (fishing, fisher)
- Catch
- Net (and other fishing terms)
- Ecosystem
- Variety

Based on findings from literature review and interviews regarding assessment approaches:

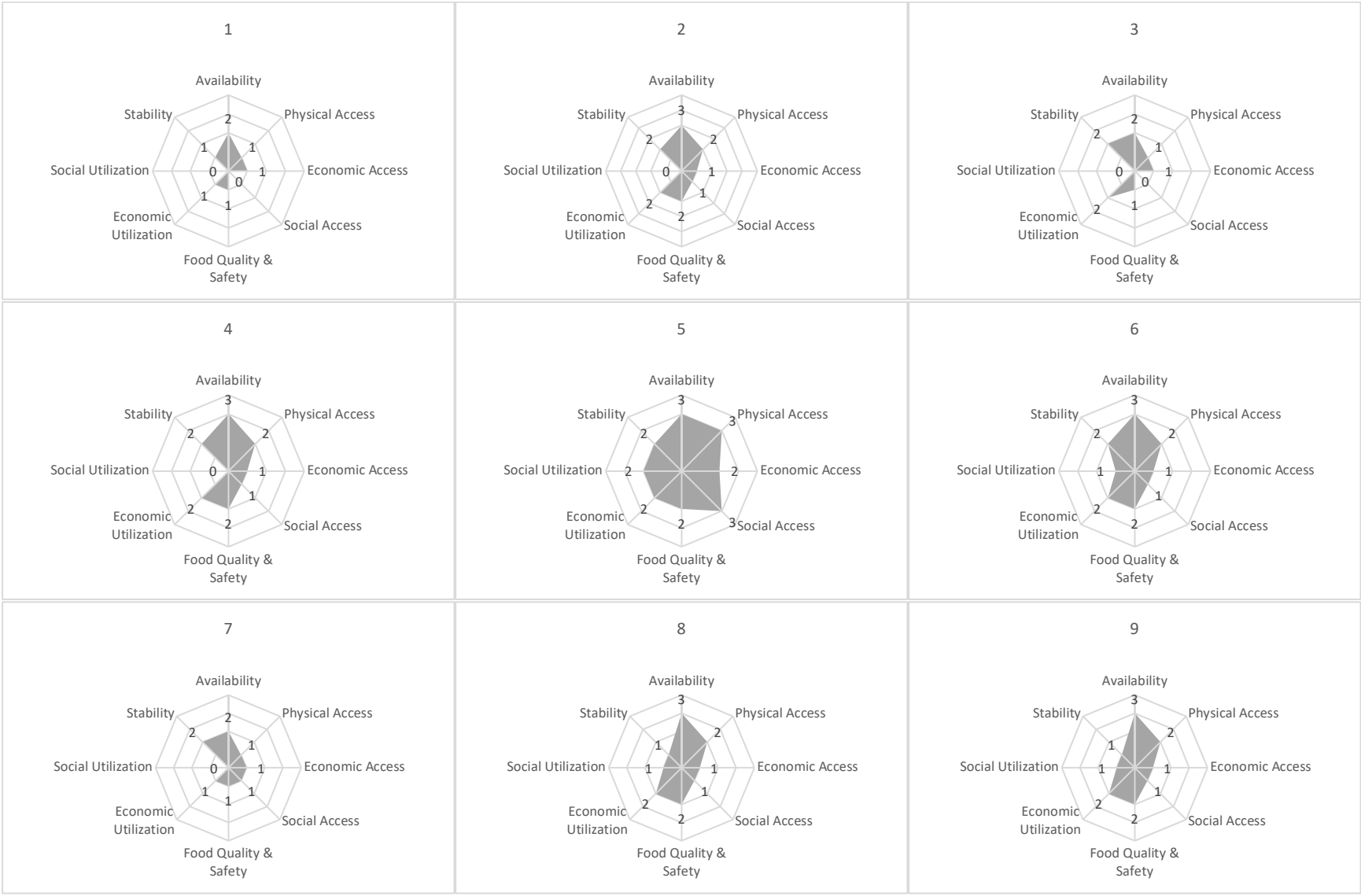
- *Public consultation*:
  - Public
  - Consult*
  - Participat*
  - Engage*
  - Traditional knowledge
- *Pathway analysis*:
  - Pathway
  - Network
  - System
  - Food web

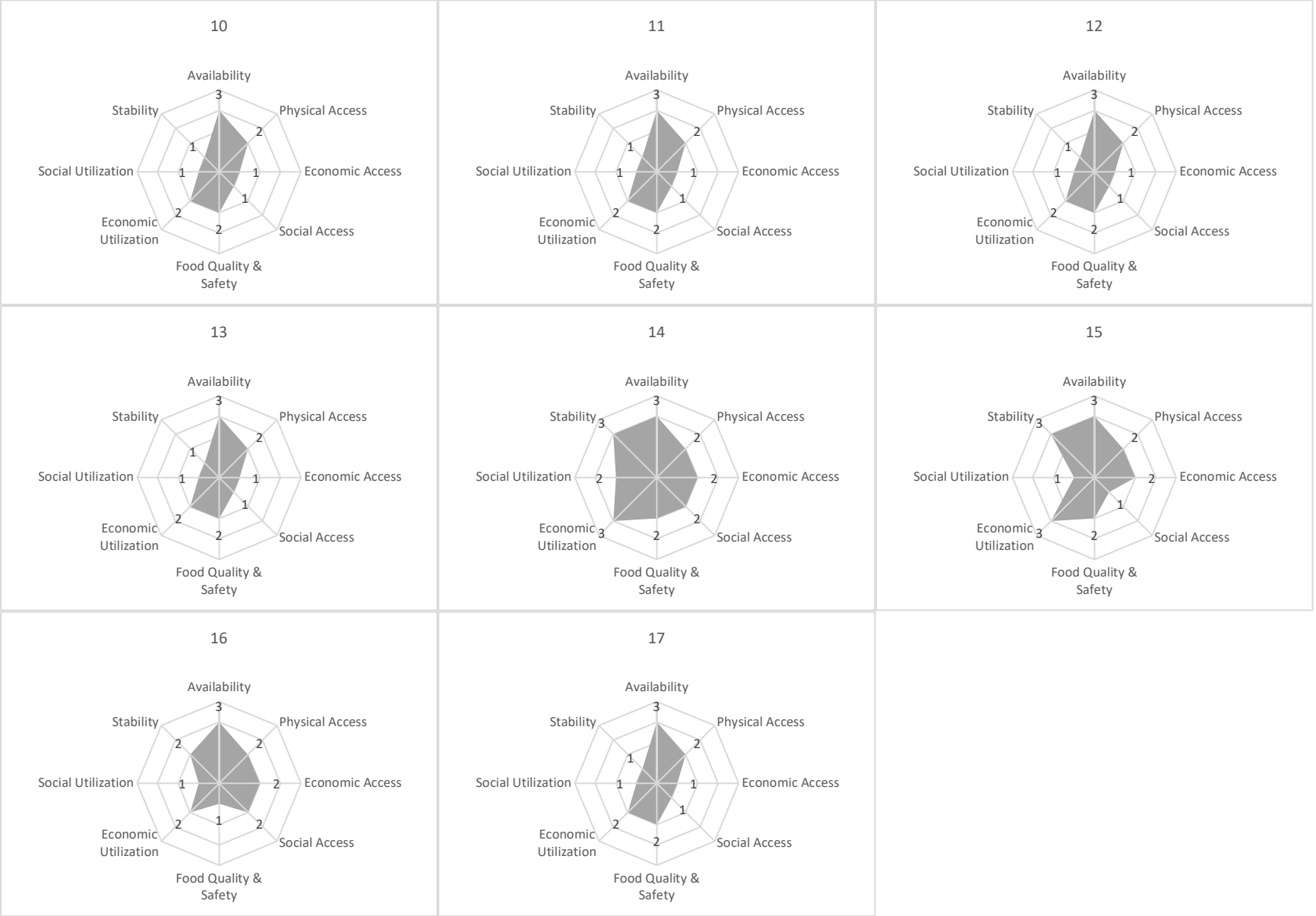
Added during data analysis:

- Aboriginal
- Indigenous
- First Nation
- Consumption
- Diet
- Taint
- Contaminant

APPENDIX E

Spider graphs showing the level of consideration for food security elements by each of the 17 SEAs analyzed




10
Availability
Physical Access
Economic Access
Social Access
Food Quality & Safety
Economic Utilization
Social Utilization
Stability
11
Availability
Physical Access
Economic Access
Social Access
Food Quality & Safety
Economic Utilization
Social Utilization
Stability
12
Availability
Physical Access
Economic Access
Social Access
Food Quality & Safety
Economic Utilization
Social Utilization
Stability
13
Availability
Physical Access
Economic Access
Social Access
Food Quality & Safety
Economic Utilization
Social Utilization
Stability
14
Availability
Physical Access
Economic Access
Social Access
Food Quality & Safety
Economic Utilization
Social Utilization
Stability
15
Availability
Physical Access
Economic Access
Social Access
Food Quality & Safety
Economic Utilization
Social Utilization
Stability
16
Availability
Physical Access
Economic Access
Social Access
Food Quality & Safety
Economic Utilization
Social Utilization
Stability
17
Availability
Physical Access
Economic Access
Social Access
Food Quality & Safety
Economic Utilization
Social Utilization
Stability

APPENDIX F

Spider graphs showing the level of consideration, as per scale point, by the SEAs for each food security elements

APPENDIX G

Selected VECs in each of the 17 SEAs

SEA / Selected VEC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
fisheries		√				√		√	√	√	√	√	√			√	√	10
marine fisheries														√				1
fisheries and fishing activity			√															1
commercial fisheries				√	√										√			3
commercial fish and fisheries							√											1
fish and invertebrates of commercial importance	√																	1
commercial fish species (e.g., snow crab and shrimp)			√															1
fish and fish habitat		√												√	√			3
marine fish and associated fish habitat				√	√													2
fish habitat						√												1
fish						√												1
marine fish and invertebrates			√															1
fish and invertebrate eggs and larvae			√															1
invertebrates and associated habitat				√	√													2
benthic invertebrates (bottom dwelling organisms)	√																	1
marine mammals and sea turles		√	√	√	√									√	√			6
marine mammals	√					√												2
sea turtles	√					√												2
marine birds	√	√		√	√										√			5
marine-associated birds						√												1
sea and coastal birds			√															1
water birds														y				1
species of special status								√	√	√	√	√	√			√	√	8
species at risk			√	√	√	√	√							√				6
species at risk and other key species															√			1
rare, threatened, or endangered species	√																	1
special areas	√		√				√	√	√	√	√	√	√			√	√	11
sensitive areas and related tourism and recreation activities				√	√													2
potentially sensitive areas						√												1
sensitive and special areas															√			1
protected and sensitive areas														√				1
forage species for fish, mammals and bird	√																	1
air quality, including greenhouse gas emissions			√															1
other marine components, activities and ocean users																√		1

Color coding	
	fisheries
	fish and invertebrates of commercial importance
	fish and invertebrates and their associated habitat
	marine mammals and sea turles
	marine-associated birds
	species of special status
	sensitive and special areas
	other

APPENDIX H

Word count totals for selected words related to culture in the 17 SEAs analyzed

Word / SEA	cultur*	tradition*	ceremon*	way of life'	custom*	folk*	social*	livelihood*	lifestyle*	ritual*	Total
1	1	0	0	0	0	0	2	0	0	0	3
2	2	3	0	0	0	0	7	0	1	0	13
3	2	4	0	0	0	0	2	1	0	0	9
4	8	4	4	0	0	0	6	0	1	0	23
5	19	77	0	0	0	0	7	1	4	0	108
6	6	0	4	0	0	0	3	0	1	1	15
7	4	9	0	0	0	0	2	0	0	0	15
8	1	6	2	0	0	0	2	1	0	0	12
9	1	6	2	0	0	0	2	1	0	0	12
10	1	6	2	0	0	0	2	1	0	0	12
11	1	6	2	0	0	0	2	1	0	0	12
12	0	8	3	0	0	0	4	1	0	0	16
13	0	8	3	0	0	0	4	1	0	0	16
14	35	27	4	3	1	0	22	9	4	0	105
15	15	4	0	1	0	0	6	3	4	0	33
16	24	11	6	0	0	1	21	9	2	0	74
17	0	7	1	0	0	0	4	0	0	0	12

APPENDIX I

Word count totals for select words related to human health and food quality in the 17 SEAs analyzed, showing total word counts and contextually relevant word count totals

Word / SEA	diet*		nutrition*		health*		safety		subsist*		menu	
	total quantity	Contextually relevant quantity	total quantity	Contextually relevant quantity	total quantity	Contextually relevant quantity	total quantity	Contextually relevant quantity	total quantity	Contextually relevant quantity	total quantity	Contextually relevant quantity
1	1	0	0	0	1	0	2	0	0	0	0	0
2	15	0	0	0	8	0	18	0	0	0	0	0
3	3	0	0	0	3	0	8	0	0	0	0	0
4	17	0	0	0	7	1	17	0	0	0	0	0
5	37	0	0	0	4	1	2	0	1	1	0	0
6	7	0	1	0	8	0	25	0	0	0	0	0
7	8	0	0	0	9	0	8	0	0	0	0	0
8	0	0	0	0	9	0	17	0	0	0	0	0
9	0	0	0	0	9	0	17	0	0	0	0	0
10	0	0	0	0	13	0	17	0	0	0	0	0
11	0	0	0	0	13	0	17	0	0	0	0	0
12	0	0	0	0	19	0	34	0	0	0	0	0
13	0	0	0	0	19	0	35	0	0	0	0	0
14	11	0	2	0	33	0	81	0	4	4	0	0
15	1	1	0	0	18	0	41	0	0	0	0	0
16	6	0	0	0	30	0	44	0	0	0	0	0
17	0	0	0	0	20	0	29	0	0	0	0	0
TOTAL	106	1	3	0	223	2	412	0	5	5	0	0

APPENDIX J

Table showing a summary of public participation in the 17 analyzed SEAs

Factor / SEA	Format	Participants	Mode of communication	Influence clearly observed?	Timing	Express Indigenous engagement?	Express engagement with other vulnerable populations?
1	Public comment period	∘ open, self-selected	∘ invitation to submit comments to SEA administrators - opportunity to express preferences	No	∘ late stage - following draft SEA	No	No
2	Stakeholder engagement	∘ lay stakeholders; ∘ professional stakeholders	∘ meetings - opportunity to express opinions and develop preferences through discussion with administrators and other participants	No	∘ preliminary stage - scoping	No	Fisheries interest groups
	Public comment period	∘ open, self-selected	∘ invitation to submit comments to SEA administrators - opportunity to express preferences	No	∘ late stage - following draft SEA	No	No
3	Stakeholder engagement	∘ lay stakeholders; ∘ professional stakeholders	unspecified	Somewhat	∘ preliminary stage - scoping	latent inclusion as stakeholder	Fisheries interest groups
	Public comment period	∘ open, self-selected; ∘ open, targeted recruitment (stakeholders invited)	∘ invitation to submit comments to SEA administrators - opportunity to express preferences ∘ public review meeting - opportunity to express opinions and develop preferences through discussion with administrators and other participants	Somewhat	∘ late stage - following draft SEA	latent inclusion as stakeholder	Fisheries interest groups
4	Stakeholder engagement	∘ lay stakeholders; ∘ professional stakeholders	∘ meetings - opportunity to express opinions and develop preferences through discussion with administrators and other participants ∘ deploy technical expertise	Somewhat	∘ Throughout	latent inclusion as stakeholder	Fisheries interest groups
	Public comment period	∘ open, self-selected; ∘ open, targeted recruitment (stakeholders invited)	∘ invitation to submit comments to SEA administrators - opportunity to express preferences	Somewhat	∘ late stage - following draft SEA	latent inclusion as stakeholder	Fisheries interest groups
5	Stakeholder engagement	∘ lay stakeholders; ∘ professional stakeholders	∘ meetings - opportunity to express opinions and develop preferences through discussion with administrators and other participants	Yes	∘ Throughout	Yes	Fisheries interest groups
	Public meetings	∘ open, self-selected; ∘ open, targeted recruitment	∘ meetings - opportunity to express opinions and develop preferences through discussion with administrators and other participants	Yes	∘ Early stage of SEA	Yes	Fisheries interest groups
	Public comment period	∘ open, self-selected; ∘ open, targeted recruitment	∘ public review meetings - opportunity to express opinions and develop preferences through discussion with administrators and other participants	Yes	∘ late stage - following draft SEA	Yes	Fisheries interest groups

Factor / SEA	Format	Participants	Mode of communication	Influence clearly observed?	Timing	Express Indigenous engagement?	Express engagement with other vulnerable populations?
6	Stakeholder engagement	∘ lay stakeholders; ∘ professional stakeholders	∘ meetings - opportunity to express opinions and develop preferences through discussion with administrators and other participants ∘ deploy technical expertise	Yes	∘ preliminary stage - scoping	No	Fisheries interest groups
	Public comment period	unspecified	∘ invitation to submit comments to SEA administrators - opportunity to express preferences	Somewhat	∘ late stage - following draft SEA	No	No
7	Stakeholder engagement	∘ lay stakeholders; ∘ professional stakeholders	∘ invitation to submit comments to SEA administrators - opportunity to express preferences	No	∘ preliminary stage - scoping ∘ late stage - following draft SEA	latent inclusion as stakeholder	Fisheries interest groups
	Public comment period	unspecified	unspecified	No	∘ preliminary stage - scoping ∘ late stage - following draft SEA	No	No
8	Stakeholder engagement	∘ lay stakeholders; ∘ professional stakeholders	∘ invitation to submit comments to SEA administrators - opportunity to express preferences	No	∘ Throughout	latent inclusion as stakeholder	Fisheries interest groups
	Public comment period	∘ lay stakeholders; ∘ professional stakeholders; ∘ open, self-selected (details not specified)	∘ stakeholder review meeting - opportunity to express opinions and develop preferences through discussion with administrators and other participants ∘ invitation to submit comments to SEA administrators - opportunity to express preferences	No	∘ late stage - following draft SEA	latent inclusion as stakeholder	Fisheries interest groups
9	Stakeholder engagement	∘ lay stakeholders; ∘ professional stakeholders	∘ invitation to submit comments to SEA administrators - opportunity to express preferences	No	∘ Throughout	latent inclusion as stakeholder	Fisheries interest groups
	Public comment period	∘ lay stakeholders; ∘ professional stakeholders; ∘ open, self-selected (details not specified)	∘ stakeholder review meeting - opportunity to express opinions and develop preferences through discussion with administrators and other participants ∘ invitation to submit comments to SEA administrators - opportunity to express preferences	No	∘ late stage - following draft SEA	latent inclusion as stakeholder	Fisheries interest groups

Factor / SEA	Format	Participants	Mode of communication	Influence clearly observed?	Timing	Express Indigenous engagement?	Express engagement with other vulnerable populations?
10	Stakeholder engagement	∘ lay stakeholders; ∘ professional stakeholders	∘ invitation to submit comments to SEA administrators - opportunity to express preferences	No	∘ Throughout	latent inclusion as stakeholder	Fisheries interest groups
	Public comment period	∘ lay stakeholders; ∘ professional stakeholders; ∘ open, self-selected (details not specified)	∘ stakeholder review meeting - opportunity to express opinions and develop preferences through discussion with administrators and other participants ∘ invitation to submit comments to SEA administrators - opportunity to express preferences	No	∘ late stage - following draft SEA	latent inclusion as stakeholder	Fisheries interest groups
11	Stakeholder engagement	∘ lay stakeholders; ∘ professional stakeholders	∘ invitation to submit comments to SEA administrators - opportunity to express preferences	No	∘ Throughout	latent inclusion as stakeholder	Fisheries interest groups
	Public comment period	∘ lay stakeholders; ∘ professional stakeholders; ∘ open, self-selected (details not specified)	∘ stakeholder review meeting - opportunity to express opinions and develop preferences through discussion with administrators and other participants ∘ invitation to submit comments to SEA administrators - opportunity to express preferences	No	∘ late stage - following draft SEA	latent inclusion as stakeholder	Fisheries interest groups
12	Stakeholder engagement	∘ lay stakeholders; ∘ professional stakeholders	∘ invitation to submit comments to SEA administrators - opportunity to express preferences	No	∘ Throughout	latent inclusion as stakeholder	Fisheries interest groups
	Public comment period	∘ lay stakeholders; ∘ professional stakeholders; ∘ open, self-selected (details not specified)	∘ stakeholder review meeting - opportunity to express opinions and develop preferences through discussion with administrators and other participants ∘ invitation to submit comments to SEA administrators - opportunity to express preferences	No	∘ late stage - following draft SEA	latent inclusion as stakeholder	Fisheries interest groups
13	Stakeholder engagement	∘ lay stakeholders; ∘ professional stakeholders	∘ invitation to submit comments to SEA administrators - opportunity to express preferences	No	∘ Throughout	latent inclusion as stakeholder	Fisheries interest groups
	Public comment period	∘ lay stakeholders; ∘ professional stakeholders; ∘ open, self-selected (details not specified)	∘ stakeholder review meeting - opportunity to express opinions and develop preferences through discussion with administrators and other participants ∘ invitation to submit comments to SEA administrators - opportunity to express preferences	No	∘ late stage - following draft SEA	latent inclusion as stakeholder	Fisheries interest groups

Factor / SEA	Format	Participants	Mode of communication	Influence clearly observed?	Timing	Express Indigenous engagement?	Express engagement with other vulnerable populations?
14	Stakeholder engagement	∘ lay stakeholders; ∘ professional stakeholders	∘ meetings - opportunity to express opinions and develop preferences through discussion with one administrators and other participants ∘ invitation to submit comments to SEA administrators - opportunity to express preferences	Yes	∘ Early stage of SEA ∘ Throughout	Yes	Fisheries interest groups; expressed desire to engage with all potentially impacted
	Public open houses	∘ open, self-selected	∘ invitation to submit comments to SEA administrators - opportunity to express opinions and develop preferences through discussion with administrators and other participants	Yes	∘ Early stage of SEA	No	No
	Public comment period	unspecified	∘ invitation to submit comments to SEA administrators - opportunity to express preferences	Yes	∘ late stage - following draft SEA	No	No
15	Stakeholder engagement	∘ lay stakeholders; ∘ professional stakeholders	∘ meetings - opportunity to express opinions and develop preferences through discussion with administrators and other participants ∘ invitation to submit comments to SEA administrators - opportunity to express preferences	Yes	∘ Early stage of SEA ∘ Throughout	Yes	Fisheries interest groups
	Public open houses	∘ open, self-selected	∘ invitation to submit comments to SEA administrators - opportunity to express opinions and develop preferences through discussion with administrators and other participants	Yes	∘ Early stage of SEA	No	No
	Public comment period	unspecified	∘ invitation to submit comments to SEA administrators - opportunity to express preferences	Yes	∘ late stage - following draft SEA	No	No
16	Stakeholder engagement	∘ lay stakeholders; ∘ professional stakeholders	∘ invitation to submit comments to SEA administrators - opportunity to express preferences	Yes	∘ preliminary scoping stage ∘ late stage - draft SEA	invited as stakeholder	Fisheries interest groups
	Public open houses	∘ open, self-selected	∘ invitation to submit comments to SEA administrators – opportunity to express preferences through discussion	Yes	∘ late stage - following draft SEA	No	No
	Public comment period	∘ open, self-selected	∘ invitation to submit comments to SEA administrators - opportunity to express preferences	Yes	∘ late stage - following draft SEA	No	No
17	Public comment period	∘ diffuse public sphere ∘ open, self-selected ∘ open, targeted recruitment	∘ invitation to submit comments to SEA administrators - opportunity to express preferences	No	∘ late stage - following draft SEA	invited as stakeholder	Fisheries interest groups

APPENDIX K

Use of 'traditional knowledge', 'TK', 'traditional ecological knowledge' and 'TEK' within 17 Canadian SEA documents

SEA	total word count
1	0
2	0
3	1
4	4
5	94
6	0
7	0
8	0
9	0
10	0
11	0
12	2
13	2
14	1
15	1
16	1
17	1